Compressed Air MAGAZINE

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COMPRESSED AIR MAGAZINE

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Telescope Pneumatic Caissons

THE pneumatic caisson is now a most familiar device and practically indispensable for the foundations of the heavy buildings continually being erected in the downtown section of New York City. Of what may be called the regular type of pneumatic caisson there remains little to be told as to its construction or the manipulations connected with its installation. The caissons here to be spoken of, however, were designed to be placed under peculiarly restricting conditions and constitute an interesting novelty in engineering. For the description of the design and construction of those caissons and the method of their emplacement we are indebted to Mr. Frank H. Eastman, Foundation Engineer, New York City, whose narrative is reproduced, some liberties being taken with the text, from *Engineering News-Record*. Many incidental items of information are found in the course of the narrative.

These telescopic compressed air caissons were used, it need not be said with complete success, to make the foundation for a large vault in the basement of the Central Union Trust Co.'s building, 80 Broadway, New York, during the recent remodeling of the bank. Four new vaults were included in the work, the largest of which, 24x27x20 ft., weighing 275 tons, was so heavy a load that it was desired to found it on hardpan or bedrock as assurance against settlement. Construction had to be carried on in the low headroom and restricted space of the basement, however, and bank operations could not be interfered with; these facts and the danger of disturbing the footings of nearby building columns made the operation delicate and difficult. The William Young Co., contractor, New York City, carried out the work, its consulting engineer on the foundation being T. Kennard Thomson, who designed and constructed the foundation and proposed the use of the telescopic caissons.

Like many similar structures in lower New York, the Central Union Trust building rests on what has been termed a floating foundation, on the soil locally known as New York quicksand. This material has safely supported many fair-sized buildings and can be absolutely relied upon, provided it is not underdrained by subways or deeper excavation. The columns rest on brick piers supported on the quicksand only 1 ft. below the cellar floor. As the vault space would extend close to the footings of these piers on three sides and to the foundations of an existing vault on the fourth side, the sinking of deep foundations presented grave difficulties. Mr. Thomson planned to use a compressed-air system of shaft-sinking which he had used in 1909 for underpinning the Cambridge Building and had patented. In this system the top section of the shaft, constructed in the open, is capped with an air lock, and the shaft below is constructed by excavating in short sections and setting lining plates. This system was chosen for the vault foundations on the assumption that the excavation would be 30 ft. deep. On making borings, however, it was found that the piers would have to go down 45 ft., and Mr. Thomson therefore decided to adopt a modification of his plan patented by the late Ogden Merrill of the firm of Merrill-Ruckgaber Co., which was used by that firm at the New York Assay Office in 1909.

In this method the caisson sections are telescoped, and the sections below the upper or air-lock section are sunk successively by jacking down against the upper section. The method is more expensive than the Thomson shaft method, but avoids the necessity of excavating below the cutting edge to insert the lining segments.

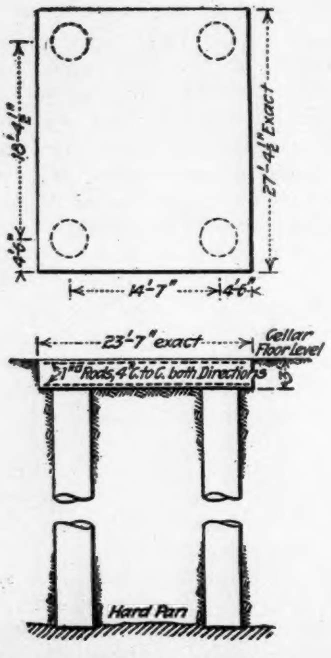
DIGGING BELOW THE CUTTING EDGE

The quicksand of lower New York can nearly always be excavated a foot or two below the

cutting edge without blowout. Thus, in a recent caisson foundation which the writer inspected, the cutting edge was stopped 2 ft. above hardpan and then 6 or 7 ft. of hardpan was removed without accident. This is probably the only time such a risk has been taken, and in the writer's opinion it should not be repeated. Excavating below the cutting edge in fine sand and clay and leaving a large excavation open for a day or two is a very different matter from excavating under a 4-ft. shaft for a few minutes while a lining plate is being set.

THE GROUNDWATER LEVEL

At the Central Union Trust Co. Building the final borings indicated rock or hardpan 62 ft.



below street curb and about 45 ft. below cellar floor. Groundwater was found 8 ft. below the cellar floor. It was decided to build the four caissons of eight sections each, the bottom or smallest one being 4 ft. in diameter and 5 ft. 4 in. high (see sketch). The bottom ends of all sections were at the same level when the caisson was fully telescoped.

From the drawing it will be seen that inside the bottom of each section was riveted a band of 3x½-in. steel plate with the top edge beveled backward, adapted to engage the beveled edge of a steel angle riveted around the top of the next inner section. Thus, when any section was forced down to its final position, the steel angle at its upper edge would catch on the steel rim plate at the bottom of the next outer section, thus preventing the sections from pulling apart.

Four diaphragms were built for each caisson, for the sake of stiffness and to afford frames for doors, using the cylinders themselves as air locks. When construction work started, however, it was found that 20-ft. headroom could be used, and, as a Mattson air lock was available that could be worked in this space, the diaphragm and doors inside the caissons were not used. This air lock was 4 ft. in diameter by 10 ft. high and had the outside door on the side of the lock.

The specifications called for the caisson sections to be calked against air pressure, but, as a matter of fact, it was necessary to use considerable putty and oakum to make them hold air; and, as this would not hold back water pressure from the outside, all the concreting was done under air pressure. Each section was 2 in. less in diameter than the one above it, so that, as the shell plates were $^{5}/_{16}$ in. and the edging bands ½ in. thick, the theoretical clearance was $^{3}/_{16}$ in. on each side, or a total of ⅜ in. For similar riveted work (the sections were butt-riveted) the clearance seems ample, while with welded sections less clearance would be needed.

Each caisson was set in a 6-ft. excavation made to receive it, so that the top was slightly below the cellar floor line. Then a trench about 3 ft. wide and deep was made all around and filled with concrete, to hold the caisson down against the air pressure. Four timber struts were set between the top of the caisson and the floor above, as extra safeguards.

JACKS FORCE DOWN CAISSON SECTIONS

Sinking was done by forcing the caisson sections down by jacks. The whole group of sections inside the first or outer one was shoved down by four 7-ton jacks (4 in. in diameter by 22 in. high) placed between the top of the second section and the inside of the roof of the outer section; until the nest was down far enough to give room for inserting these jacks they were placed between pairs of beams attached to the lower nest and to the air-lock shaft. When sinking had progressed to the point where the angle at the top of the second section came to bearing on the band at the foot of the outer section, four 6x6-in. oak struts were inserted to hold down the second section during the subsequent jacking. This process was repeated for the successive stages of sinking until the last section was down and the shaft bottomed in the hardpan.

When the first two caissons were delivered on the job, two 800-cu.ft. compressors were set up over the locations of the third and fourth caissons, with an air receiver over them. When

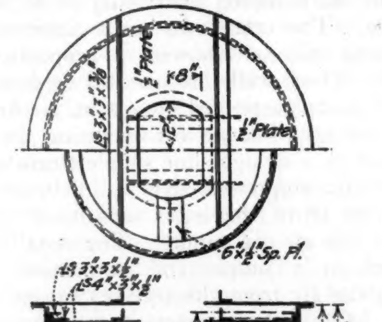
the first two cylinders had been sunk and concreted, the compressors were moved to a position over them, permitting the third and fourth caissons to be sunk without going outside the space occupied by the vaults.

The compressors and the first two caissons arrived on the site Feb. 17, 1919, and air was put on Feb. 22. Eight men were worked in each shift.

Five working days of three eight-hour shifts each were required to complete one caisson shaft. The fourth caisson was completed Mar. 28, and the concrete vault-floor slab, 24x27 ft. by 2 ft. thick, was completed April 9.

OPERATIONS KEPT QUIET

Excavation spoil was placed in tin pails, hoisted to the lock on top of the caisson and dumped; it was then put in canvas bags and carried out of



the building at night. Concrete materials were brought in in the same way. Mixing was done by hand.

The first two caissons gave more or less trouble from jamming,, making it quite difficult for the jacks to force the lower sections down. The last two caissons, however, though presumably the same as the first two in every respect, worked very freely, never requiring anything like the full strength of the jacks.

As each section went down, oakum and putty were used to seal all joints. This was found to be a cheap and effective material for sealing. These precautions were vital, for escape of compressed air or the entrance of material from the outside into the working chamber might have endangered the stability of the bank building.

GROUNDWATER TAKES A JUMP

The entire operation was carried on without the slightset accident and without any damage to the building. There was, however, an interesting occurrence during the sinking of the first caisson. The groundwater level suddenly rose about 9 ft. However, the water suddenly dropped back 10 ft. and gave no further trouble. No explanation of the peculiar occurrence was ever obtained. A leak in a water main or an extra high tide and wind might have been responsible. Needless to say, if such changes in the water level occur periodically the foundations of buildings now resting on quicksand may in time be seriously endangered.

The entire work of reconstruction in the Central Union Trust Co. Building was under the supervision of A. A. MacDonald, of the William Young Co., the contractor, and Frank H. Eastman was superintendent in charge for the company for the caisson foundation.

FOR MORE MACHINERY IN QUARRY WORK

There is no doubt that the cost of stone can be lowered without any depression in wages, by a wider use of machinery, says Oliver Bowles of the U. S. Geological Survey, which would seem to be a most authoritative boost for compressed air and what the air implies.

Already America is far in advance of European countries in the use of machinery in stone working, and as a consequence the cost per cubic foot of Indiana limestone averages less than that of the English Portland stone (the two stones being similar), although wages paid in the Indiana district are about twice as high as in England.

The wide use of Indiana stone is largely due to economical methods of handling it, and a wider use of other types of stone could be brought about similarly by introducing more machinery into quarries and shops. The stone worker has, therefore, nothing to fear from the wide use of mechanical equipment, for it demands more skilled workers at higher wages, and the reduction in cost that results from the use of such equipment broadens the market, with consequent increased activity in the stone industries.

It is evident, says Mr. Bowles, that there is no more fruitful field for improvement in conditions in the stone industry than that of highly developed mechanical equipment.

Air Lift Pumping

THE following interesting, informing and suggestive notes upon air-life pumping are by Mr. John Oliphant, Manager of the Air-Lift Pumping Department of the Sullivan Machinery Company, Chicago, and are here reproduced from the *Canadian Engineer*.

While I am not going to enter at this time into the principles of air-lift pumping, I would like to call your attention to the advisability of a perfect emulsion of air and water at the footpiece in order to secure the best economy, and also to lay stress upon the care with which should be calculated the diameters of the water and air pipes for different lifts and different submergences.

While it is a fact that there are several types of mechanical deep-well pumps that up to certain depths will give theoretically a higher efficiency than air-lift, yet this difference in efficiency is theoretical rather than practical. It has been demonstrated time and again that air lift, even with its lower theoretical overall power efficiency, but with immunity from derangement, has been placed ahead of the deep-well pumps under many conditions of operation.

The village of Maywood, a suburb of Chicago, has a compressor handling a single well, pumping at the rate of 700 gallons per minute, with a lift of over 300 ft. This compressor has been operating for four years, twenty-four hours per day, with a stoppage of only a few minutes during the twenty-four hours for necessary examination and adjustments. This plant has been operated at the above capacity continuously at absolutely no cost for repairs and no shut-downs, except those above indicated. I believe this would compare favourably with the operation of a mechanical deep-well pump even at its higher rated efficiency.

There are a great many occasions where the air lift can be used as an auxiliary to a high-duty suction plant pumping from deep wells. Such a case came up over a year ago at Clinton, Ill., where they secure their water by suction from deep wells, and for ordinary purposes secure a sufficient amount by this method. But in case of peak loads in the summer and in case of fire, it was found that the supply secured by suction was not sufficient to cover their requirements.

The supply is secured from some half-dozen wells, having a surface flow of limited volume. These are connected so as to flow into a surface reservoir, or may be direct connected to mains by means of suction pumps. Experience showed that when suction was resorted to, the supply for the summer hot weather load, or for an extended fire demand, was insufficient. Three of the wells were therefore connected with an air-lift system arranged to discharge into the reservoir, using the suction piping as a gravity flow line. A suitable arrangement of valves is provided to permit this flow from the wells to the reservoir, while the service pumps draw their supply from the reservoir by suction. By this arrangement, the water supply was more than doubled from these three wells. One of the 8 in. wells had a natural artesian flow of about 150 gallons per minute. When under suction from the pumps, the pull-down was 20 ft., increasing the flow to 500 gallons per minute. When this well was connected up for operation under the air lift, its production was increased to 1,035 gallons per minute, the pumping head being 50 ft. below the surface. The other two wells connected up in the same manner showed a proportionate increase. These wells are handled by means of an air-lift pump suspended on a 2 in. air line in the 8 in. casing. The air for operating the wells is supplied by a straight-line simple steam and compound air compressor, size 14 in. by 16 in. and 10 in. by 16 in., having a capacity of 558 cubic feet of free air per minute. The installation was effected in a simple and economical manner, piping the air from the receiver to and into the wells. On ordinary service the pumps secure sufficient supply by direct suction. When an increase is demanded by the summer domestic requirements or by fire, it is merely necessary to start the compressor, throw open a few valves, and the supply from the wells is more than doubled.

For general information I include below some figures secured from two installations made at Galesburg, Ill. The first of these has been in operation over a year, and the second about six months. These plants are located at different points in the town and centrifugal pumps used to take the water from the service reservoirs and force it directly into the mains. You will notice that the efficiency indicated in these reports is the electric input to the motor, as compared to foot-pounds of work done, and includes all motor, transmission and compressor losses, and we believe will compare favourably with the highest type of mechanical pump under the severe lifts obtaining at these installations. The city of Galesburg has had considerable difficulty in securing sufficient water for the public supply. A number of wells in the neighborhood of the old pumping plants have been driven and equipped with various devices, but failed to give the amount of water need-

ed. The old plant consists of three deep and six shallow wells, with a combined yield of about 250 gallons per minute, and has been very expensive to operate and maintain, and it was therefore determined to sink a new well.

The construction of this well was as follows: 40 ft. of 24 in. heavy steel casing, 106 ft. of 20 in., 130 ft. of 16 in., and 350 ft. of 12 in. steel casing. The 12 in. is sealed in the rock. The hole was then drilled 12 in. in diameter to a depth of 1,085 ft. from the surface, then reduced to 10 in. and drilled down to 1,255 ft. through the St. Peter's sandstone formation. The well was then shot with two 200 lb. charges of 100 per cent. gelatin, covering the entire sand rock strata, and carefully cleaned out. Wrought iron 10 in. pipe was installed and sealed into the top of the 12 in. pipe, approximately 350 ft. from the surface of the ground. This extends to within 3 ft. of the top of the sandstone strata, hermetically sealing the well from all water in the strata above the St. Peter's sandstone. The analysis made from the water secured from the completed well was superior to that of all other wells in the territory, on account of the sealing off of the upper strata.

At the site of this well an air-lift plant was constructed for lifting the water from the well to a small surface reservoir. Thence the water is forced into the mains against 40 lb. pressure, by means of a centrifugal pump. The air-lift equipment consists of one angle-compound compressor, with 16 in. and 9¾ in. by 12 in. cylinders, arranged with short belt drive and unloading valve; one standard 5 in. foot piece, outside air line, and well-head with umbrella separator; one 42 in. by 8 ft. vertical steel air receiver; and one 100 horse-power motor. The following are the conditions of operation and the results of the test on the well:—Depth of well, 1,252 ft.; water pipe in well, 235 ft. of 5 in., 331 ft. of 6 in.; main air pipe in well, 235 ft. of 2 in., 331 ft. of 2½ in.

On account of the severe drop, an auxiliary starting device was installed at a depth of 481 ft. 8 in., to pump off the head and keep the starting pressure within the range of the compressor.

Static head, from ground	186 ft.
Drop	118 ft.
Elevation above surface	7 ft.
Total lift	311 ft.
Operating submergence	262 ft.
Percentage of submergence	45.8
Depth of pump in well	566 ft.
Operating pressure	121 lb.
Starting pressure with auxiliary	129 lb.
Gallons per minute pumped	450
Actual cubic feet free air used per min.	450
Revolutions of compressor	179
Water horse-power—that is, foot-pounds of work done	35.5
Operating horse-power	94
Efficiency, per cent.	37.5

The efficiency shown is considered excellent, and this result was made possible by careful proportioning of the sizes of air and water piping, proper location of the foot piece or pump in the well, and by the use of improved foot pieces, providing a continuous flow of water. In this design the air is discharged from the foot piece into the water in the well casing in a multitude of fine jets, creating a very thorough mixture or emulsion of air and water. This action secures the maximum efficiency, as the chance of slippage is reduced to the minimum.

The figures on the second plant, known as the Bradley Well No. 2, are as follows, and are taken from a test on March 8th, 1919:—Depth of well, 1,245 ft.; diameter, 360 ft. of 15 in., 250 ft. of 14¼ in., 635 ft. of 13½ in.; water pipe in well, 204 ft. of 8 in., 213 ft. of 7 in., 190 ft. of 6 in.; main air line, 600 ft. of 3 in.; auxiliary line, 500 ft. of 1½ in.

CONDITIONS OF OPERATION.

Static head from ground	190 ft.
Drop	157 ft.
Elevation above surface	7 ft.
Total lift	354 ft.
Operating submergence	253 ft.
Percentage of submergence	41.75
Depth of pump in well	600 ft.
Operating pressure	115 lb.
Shut-in pressure	110 lb.
Starting pressure with auxiliary	135 lb.
Gallons per minute pumped	650
Actual cubic feet free air used per min.	719
Displacement	883
Revolutions of compressor	214
Water horse-power—that is, foot-pounds of work done	58.2
Operating air horse-power	148
Efficiency of air compressor compared to work done, percentage	39.3
Estimated input efficiency, percentage	35.8
Estimated motor efficiency, percentage	91

Attention is called to the advantage of air-lift pumping in the case of wells, the waters from which, in order to make them suitable for domestic or other purposes, require treatment for the elimination of sulphates or carbonates of iron in solution, or other impurities which can be oxidised and precipitated by aeration and then

removed by filtration. In this method of pumping the compressed air is forced into and commingled with the water at the bottom, or at least deep in the well, by means of a multiplicity of fine streams or jets, ensuring the most intimate mixture of the air and water, every particle of the water being permeated with air as it rises in the eduction pipe. Oxidation and precipitation of the iron solution thus takes place with the greatest possible rapidity, and it is then a simple matter to remove it by filtration. Waters containing carbonate of iron are especially susceptible to treatment in this manner, the pumping operation at the same time serving the purpose of freeing the dissolved iron, so that it may be removed by the filter without even intermediate sedimentation.

The treatment of waters containing sulphates of iron are more difficult, and the use of ample sedimentation tanks or basins ahead of the filter are advisable. In some cases aeration must be supplemented by the feeding of a very small quantity of lime into the water to accelerate sedimentation, but in any event the thorough aeration of the water in the pumping operation is a very important and vital adjunct to the purification process.

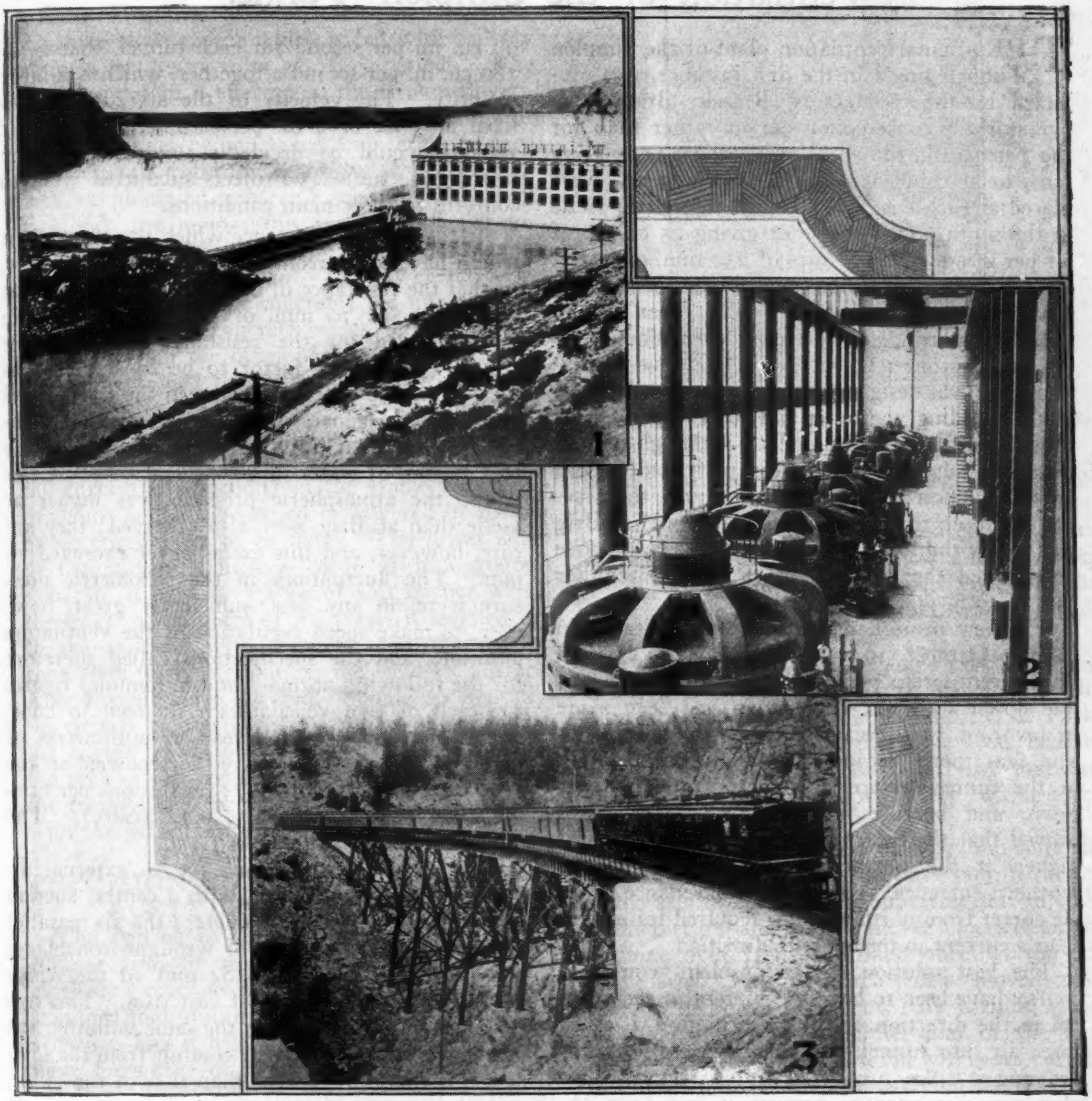
Combined air-lift pumping and purification plants can be arranged in many different ways, according to local conditions. In some cases the air-lift merely delivers the water to a sedimentation tank combined with a filter located at the surface, and as close to the well as practical, the effluent from the filter flowing by gravity to a surface reservoir or sump, whence it is forced by piston or centrifugal pumps into the service system, or to a service tank or reservoir located at a suitable elevation. In other cases, where the well or wells are deep enough to provide the necessary submergence, and others are right to utilize the air-lift—by means of an air-lift booster and re-lift jet—to lift and force the water in one operation from the wells to the elevated storage reservoir, this reservoir or tank also acts as a sedimentation tank, and the water can pass from it through a pressure filter into the service pipes. A third arrangement is where the pressure filter is placed in the line between the well and the elevated reservoir, and the water lifted and forced by the air-lift in one operation from the well through the filter and up to the elevated service reservoir.

I would like to call special attention to the two latter arrangements, as it is my observation that the possibilities of the air-lift, as a means of forcing the lifted water to a point beyond the well-top, are ont generally realized. While this method has its limitations, there are many situations where it can be used to advantage, eliminating the complication of a separate pump, with its incidental surface suction basin for this service.

In the boosters generally used in these installations the discharge from the well is brought to a complete stop by striking an umbrella separator in the booster, throwing the water to the bottom of the booster and allowing the air to escape from the top. Owing to the complete emulsion of the air and water, a considerable proportion of the air is carried over in the discharge from the booster, and, while this is of benefit where filtration is to be used as above described, it becomes detrimental where this class of booster is discharged into long horizontal lines, on account of the air pocketing in the high points, and also where the discharge is to be carried directly to pumps or condensers. In order to overcome the difficulties above mentioned, and to ensure perfect separation of the air and water, a separator has been designed which consists of a simple shell or cylinder with top and bottom. The combined air and water is discharged into the top and at one side, at a tangent to the periphery, under high velocity from the well, causing it to swirl and effecting a perfect separation of the air and water, the water leaving the separator from an outlet at the bottom, tangent to the periphery, and the air passing off at the top. The downward centrifugal action leaves the air quite dry and frees the water entirely from air bubbles. In this centrifugal arrangement the water is not brought to a dead stop and reversed, with consequent loss of all momentum, as in some older types of boosters, but its direction is gradually changed, so that it is carried on to the outlet of the separator without loss of momentum, and with proportionately greater efficiency.

The Ingersoll-Rand Company has opened an office in Dallas, Texas, located in the Sam Houston Life Building, No. 1521 Commerce Street, with Mr. R. H. Brown, Jr., as manager. Territory to be handled by this office will be that part of Texas previously handled from St. Louis and the entire State of Oklahoma with the exception of Ottawa County, which remains in St. Louis territory. Effective on October 1, Mr. L. J. Davis was made manager of the St. Louis office, which will retain all of its old territory not assigned to the Dallas office. Mr. D. M. Armstead, who has been manager of St. Louis office, has been assigned to the London office as sales manager for continental business, acting under the direction of Mr. W. M. Treglown, Jr., general manager.

Railway Trains Driven by Harnessed Water Power



Photos copyright, Underwood & Underwood.

Compressed air played an important part in the building of the dam at Great Falls, Mont., and in the erection of the power house there. Picture No. 1 shows the dam that collects the water that feeds the turbines shown in Picture No. 2. In the power house are the turbines employed to generate electric current for the operation of the 440-mile electric division of the Chicago, Milwaukee & St. Paul Railroad. This power house also provides current for many local industries. Picture No. 3 shows a limited St. Paul train descending a two per cent. grade on the eastern slope of the Rockies. The electric division of the St. Paul is from Harlowton, Montana, to Avery, Idaho, and eventually will be extended all the way to Seattle, Wash.

William Allen Ragan, for years in the aluminum and white metal alloys business of Indiana, Ohio and Michigan, has started the Ragan Metal Sales Co. with offices in Indianapolis, selling all metals except pig iron and steel.

Ventilation of the Simplon Tunnel*

THE original ventilation plant of the Simplon Tunnel, single in the first instance, was projected by the contractors, Brandt, Brandau & Co., for the construction period rather than for the permanent tunnel service. Two ventilating fans, to be coupled in parallel or in series, were placed at each entrance, Brig in the north, Iselle in the south, each capable of giving 25 cu. m. of air per second at a pressure of 250 mm. of water. By the time the second tunnel was being constructed the transference of the power station to Massaboden had deprived the turbines driving the fans of their water, and the new ventilation plant was designed both for the second period of the building operation and for the permanent ventilation of the two tunnels. Although the old plant had admitted of working with compression or with suction from either tunnel end, the practice had been to force air into the tunnel at Brig and to withdraw it at Iselle. That practice necessitated the provision of a screen at either end.

The new project, which was actually taken in hand in October, 1913, provided for the erection of one ventilation plant only, and this plant was laid down at Brig. A selection had been made in favor of Brig because the central power station was there, because the whole organization of the tunnel service was concentrated at that town, and because meteorological observations proved that the barometric pressure is in general higher at the northern entrance than at the southern entrance, so that the maintenance of an air curret from north to south required less power than a current in the opposite direction.

The best solution of the problem would, of course, have been to have the current in each tunnel in the direction of the train motion, i. e., to force air into tunnel No. 1 at Brig while withdrawing it from tunnel No. 11 at Brig. This plan was not adopted because it had been observed that, when the air was taken in at Iselle, all the iron in the tunnel structure rusted badly. The reason is meteorological. The air at the southern entrance is mostly warmer and more moist than at the northern inlet at Brig; air travelling to the north in the tunnel therefore deposits its moisture as it becomes cooled.

In order to reduce the air resistance to the train and the power demand on the ventilation plant it was decided to open the curtain at Brig, when a train starts at Iselle northwards in tunnel II and to shut the ventilation down for the time of the passage. The maximum air supply was fixed at 90 cu. m. per second for each tunnel, that is, at 180 cu. m. per second altogether, which is a large quantity. The velocity of the air current was fixed at 3 m. or 4 m. per second; a higher air velocity would be decidedly unpleasant to the men in the tunnel. Projects submitted were to conform to these main conditions.

As regards the resistance which the air current would have to overcome, Messrs. Sulzer calculated that the resistance in the tunnel would amount to 60 mm. or 70 mm. of water; 4 mm. more were allowed for the resistance in the feeder trunks. A further factor to be considered was the barometric difference between the two tunnel openings. In general the barometer stands higher at Brig than at Iselle, the difference amounting to 115 mm. of water in exceptional cases. Cases where the atmospheric pressure was higher at Iselle than at Brig were also observed; they are rare, however, and this excess never exceeded 70 mm. The fluctuations in the barometric pressure were, in any case, sufficiently great, however, to make speed regulation of the ventilators desirable, and the specifications called therefore for the following normal (and minimum) figures for each of two ventilators: Air feed in cubic metres per second, 180; head in millimetres of water, 130 (70); effective horsepower at the ventilator shaft, 500 (300); revolutions per minute, 325 (240); efficiency, 0.72 (0.65). The average density of the air is 1.15.

Each ventilator is a fan, 3.5 m. external diameter, 1,564 mm. width, with a central suction opening 2,600 mm. in diameter; the six parallel rows of buckets, built up of wrought-iron blades and partitions, take up 1,284 mm. of the width of the wheel; the hub is of cast iron. The two fans have been mounted in the same building, the one above the other; the air conduit from the lower fan is therefore steeper than that of the other, and the two conduits unite at an acute angle at which the main valve is hinged. This valve, 7.85 m. long and 4.5 m. wide, closes either the lower or the upper conduit, being raised or lowered by machinery or by hand with the aid of two wire ropes. When only one fan is working, this valve closes the other channel; when both fans are run in series, the one draws in air through its suction gate and sends it through the second fan; one conduit thus remains again closed. There are further four valves for the accessory air channels. Each fan weighs 12 tons; the electric motor driving it weighs 11 tons, and the regulating devices, transformers, switches, etc., more than double the latter figure. The casing of each

*Condensed from *Engineering*.

fan is brickwork, except the first helical portion which is made of sheet iron; the two conduits are square in section, the side being 4.5 m.

Each fan is directly coupled with an asynchronous three-phase motor which is fed with railway currents of 3,200 volts at 16⅔ periods. The speed regulation is effected on the Brown-Boveri-Scherbius system; the rotor current of the motor is not absorbed by resistance, but serves to feed a three-phase collector motor which is coupled with an induction generator sending its current back into the mains; this regulating apparatus alone weighs 9.5 tons. The whole building is a ferro-concrete structure. The lower fan rests on a massive block of concrete; the upper fan is mounted on ferro-concrete beams, but the base is separated from the other parts of the building.

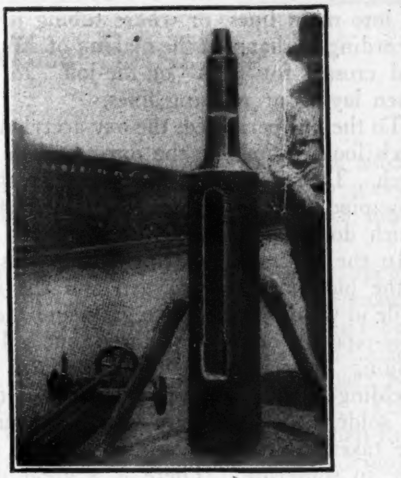
We mentioned that each northern tunnel entrance can be closed by a screen or curtain. For this purpose a portal frame of iron is built into the brickwork, about 2 m. from each tunnel end; the curtain is suspended in the frame by means of chains and can be raised or lowered by means of electric devices or by hand. The lower edge of the curtain, which is made of impregnated sailcloth, is held by a rope of soft copper wire; the track in the plane of the frame is levelled up to the railhead with concrete, and the copper rope rests fairly airtight on the concrete surface when the curtain is lowered. Should accidentally the curtain be down when a train is approaching, the engine would burst through the curtain and the rope of soft copper wire without endangering the train. The curtain is automatically operated with the aid of track contacts.

PRECISION CUTTING BY THE OXY-ACETYLENE BLOW-PIPE

The cutting of slots or openings in solid or tubular iron or steel has been heretofore exclusively a machine shop operation requiring some standard tool, milling machine, slotter, plower or whatnot, and it has not been a job that could be done anywhere or everywhere as might be requested. The operation was not only restricted to the shop and to shop tools but it was also necessarily slow and costly.

Now, however, as is told by Mr. C. C. Philips, in *Natural Gas and Gasoline,* a simple hand-operated carrier, propelled by long screw, and having a lateral arm carrying the oxy-acetylene cutting blow-pipe, takes the place of the expensive machine-tool *in the shop,* and makes possible various forms of cutting-away, or cutting-out, "on-the-job."

Our illustration shows a steel slip-socket weighing 1,600 pounds, with the piece cut-out by the torch-flame, standing to the right. The piece to the left has been cut from the rear of the slip-socket.



SLIP-SOCKET WITH CUTOUTS MADE BY OXY-ACETYLENE.

The pieces cut out by the oxy-acetylene blow-pipe were three inches in thickness, and six inches at widest point, four inches wide throughout the balance of the cut, which, all told, was 26 inches long.

In cutting the slots in the slip-socket appearing in our illustration, which work was done at the plant of Acme Fishing Tool Company, of Parkersburg, West Virginia, the socket was laid on its side, parallel to the torch-carrying machine, in the right angle arm of which the cutting-torch was carried.

To describe the method of operation note the following: The torch, as we have said, is carried in the arm of the machine appearing left to right in the picture, and may be moved crosswise of the machine by turning the hand-wheel at the end of the arm. Thus the torch will be moved crosswise of the piece to be cut. By turning either of the hand-wheels at either end of the long screw of the machine, the torch will move parallel to the machine, as the arm carrying the torch has a threaded sleeve, which moves forward or back as desired on the long screw we have mentioned.

The slip-socket appearing in our illustration is used for "fishing" churn drill tools in oil or gas well drillings, where the tools have broken loose from the drilling rope.

It will be easily recognized that if the oxy-acetylene blow-pipe can be used in cutting holes that must be mechanically correct in form and measure, it can certainly be depended upon as the most efficient method of cutting tubing, casing, etc., in the field and at well-drillings, also for cutting-in openings where laterals are to be weld-

ed into main lines, or where tubing is to be cut according to shape, in the making of X's, Y's, T's, and crosses for lines "on-the-job," in the field, when laying or relaying lines.

To the inexperienced, the oxy-acetylene cutting-torch looks quite like the oxy-acetylene welding-torch. There is a difference, however, the cutting blow-pipe having an additional jet of oxygen, which does the actual cutting.

In the process of cutting, all that is required is the blow-pipe, the oxygen and the acetylene, while in welding, these two gases and the welding blow-pipe not only are required, but a flux in the welding of cast-iron, while especially prepared "welding-rod" is required, as solder is needed in the soldering of tin-ware. The welding blow-pipe takes the place in welding, of the soldering iron, in soldering. There is a great difference between the two processes, however, for, in soldering, a dissimilar metal is merely *deposited,* whereas, in welding, a similar metal is actually fused or melted into the parent metal.

Just a word in connection with the welding-rod matter should be said to those who are welding, or purpose taking up welding of steel or wrought iron pipe and casings. Never use poor "welding-rod," especially where pressure is to be applied in the pipe, or where that which is conveyed, is of sufficient value to make even slight leakage an expense.

A perfect weld requires not only the services of a capable welder, but also the use of the very best, metallurgically correct "welding-rod." It is the material of the "welding-rod," that builds up and unites the two sections at the point of welding a steel or wrought iron pipe.

Again, speaking of cutting the two slots in the slip-socket, these cuts were so straight and perfect that no finishing after the cutting was necessary, and the two complete cutouts were finished in eight minutes. Formerly it required one machinist eight hours to make the two cuts on a milling. The saving in time and altogether by the use of the oxy-acetylene amounts to twenty-five dollars per socket.

NEW YORK CITY'S METEOROLOGY

A New York City daily recently published some interesting facts regarding average weather conditions in the American metropolis, which would be even more interesting were they compared with similar facts as affecting London. New York, it is noted, lies at the junction of the three great storm paths of the United States, yet it has fewer rainy days than Buffalo, Rochester, Oswego or Albany. It has more dry days than Philadelphia, Pittsburgh, Cincinnati and Cleveland.

In an average year New York has 58 per cent. of the possible amount of sunshine for this latitude. Washington has the same, but Cincinnati, Kansas City and Portland, Ore., have less sunshine.

The average hourly wind velocity at the Central Park Observatory for the last fifty years was seven miles an hour. This is the same as Washington, while Chicago shows sixteen miles and Philadelphia, Indianapolis and San Francisco average ten miles and over.

New York's prevailing winds are from north to west except in June, July and August. Then the winds come from the cooler surface of the ocean and give this Wonder City its deserved reputation as a Summer resort.

New York's temperature, the year round, is more equable than in most American cities. The highest recorded here is 102, and the lowest thirteen below. Cincinnati shows 105, and seven below; Chicago 103, and twenty-three below; St. Louis 107, and twenty-two below; Omaha 106, and thirty-two below; Denver 100, and twenty-nine below.

TO TUNNEL MT. BLANC

A special dispatch from Rome to the *Chicago Tribune,* states that negotiations are being concluded between a representative of a French syndicate and the Italian Government for the construction of a tunnel through Mount Blanc, which will be one of the greatest projects to pass through the Alps. Studies for the project have been going on for about fifteen years. It is now proposed to build an electric railway from Chamonix in Savoy to Amsta in the province of Turin, a length of 50 miles, whereof 10 will be under Mount Blanc. The new railway will join two of the most celebrated valleys with magnificent scenery and perhaps the most renowned among all picturesque cities of the Alps.

Lidgerwood Office in Detroit

The Lidgerwood Mfg. Company of New York, announce the opening of a branch office in the Hammond Building, Detroit, Mich., for the sale of their contractors hoists, derricks and cableways, mine hoists, ships winches and steering gear, and logging machinery. Mr. R. S. Hutchinson, formerly of the Lidgerwood Office in Philadelphia will have charge of the Detroit Office, under the direction of Mr. F. B. Knight of the Lidgerwood Chicago Office, who previously handled this business in Detroit.

I. F. Aguilar Revoredo has opened an office as consulting mining engineer at Casillo 176, Oruro, Bolivia.

Use of Jackhamer Drills for Mine Sampling

By JOHN H. EGGERS*

SOME years ago, a short article appeared in one of the mining periodicals, which described a method of taking samples with the non-rotating jackhamer, or plugger type of machine drills, with which moil bits were used. In the instance at hand, the work was done with ordinary jackhamer drills and also, though to a less extent, with the stoping drill, using both the regular cross and Carr bits.

Special small non-rotating jackhamer or plugger type of jackhamer drills and moil bits should be of decided advantage in place of hammers and moils in cutting out channel samples, but such special equipment would probably not be available at a property under investigation, whereas the method herein described makes use of the jackhamer and stoping drills, which are more likely to be found as part of the mine equipment.

In the instance at hand, a preliminary inspection of the ore to be sampled, as well as trials by two crews at cutting the samples with hammers and moils, indicated that the rock was extremely hard, and that either a larger crew than desirable or some other method would have to be employed.

At first it was planned to try the jackhamer drill and moil bits, as this method was understood to have been previously used. However, after a consideration of various suggestions (some made by the working crew, for which credit is due), it was decided to use the jackhamer drills and the ordinary crossbits; the plan being to drill two rows of shallow plug holes along the line of the channel to be cut, and to then chip, moil, and break out the undrilled rock remaining between the holes, saving the drillings and the chips as the sample.

As the work progressed, it became apparent that one row of holes drilled sufficiently deep (several inches) would be adequate for the sample, and also that, if the holes were drilled closely enough, the rock between the holes in the row would break out during the drilling. This served to shorten the time required in taking the samples, for one row of holes was found to be sufficient.

The channel cut by drilling one row of holes was rather irregular in outline, being the full width of the drill bit opposite the center of each hole, but only about two-thirds of this width between the holes, so that, instead of being represented by two parallel straight lines, the sides of the channel were represented by two wavy lines that diverged opposite the holes and converged between the holes.

The first cuts were greatly improved upon, when, as the men became accustomed to the work, it was found that by moving the drill and bit from one side to the other, or back and forth along the line of the sample, a channel could be cut out that would be uniform and regular. The final result was a channel, slightly wider than the drill bit, that could be cut to any desired length and depth.

The channel cut as described may be made practically identical, as far as dimensions go, with the usual channel cut in sampling; the only difference being that the greater dimension of the cross-section of the channel, which is usually the width (of from three to six inches), becomes, instead, the depth of the channel, and is dependent on the depth to which the drill is driven into the rock. This may be considered, ordinarily, as an advantage than otherwise, for, owing to the decreased area of the usual irregular surface of the face to be sampled, it allows an approach to a more ideal section or channel. In fact, the face or surface of the rock or ore to be sampled may be cleaned and evened off by drilling a shallow preliminary channel along the line of the sample. The drillings from this preliminary cut would be discarded, and the sample would be taken by deepening the preliminary channel and saving the drillings therefrom as the sample, as described in the details which follow.

There seems to be no reason why the use of machine drills should not be possible in the sampling of many types and structures of rocks and ores, where the employment of the apparatus is justified from an economic point of view, as the practice is dependent largely on the accessibility of the air line, hose and machine drills, and the comparative time required to make the necessary connections.

Though the samples taken in the work described were comparatively small, they were sufficiently large for the purpose at hand, and it is apparent that much larger samples can be cut, with equal and possibly greater advantage, when desired. The use of the machine drills in this particular examination resulted in the securing of a greater number of necessary samples, at less cost per sample, and with a greater degree of accuracy,

*Abstract from Eng. & Min. Journal, Aug. 30.

than would have been possible had hammers and moils been used.

An additional advantage is to be found in that, as the work of the crew becomes largely mechanical, the matter of the personal equation and its possible effects on the sample is largely eliminated. It was also found that practically all of the chips and drillings cut from the channel were saved in the sampling, whereas it is not uncommon, when using hammers and moils, and catching the chips in a candle box, to lose at least a small percentage.

Possibly the greatest advantage is that the method permits the use of power drills instead of hard manual labor. It is significant that though machinery has been adopted for use over a wide range of operations about the mines, most of the work of sampling is still done by manual labor, and there is little reason why the advantages in the use of machinery should not, at least to a considerable degree, be also applicable to this work.

The same procedure applies to the use of the stoping drills in taking overhead samples across the roofs of levels or other workings. However, the action of the stoping drill does not allow of moving the drill backward and forward along the channel, as when using a jackhamer in taking a face sample. For this reason it is necessary to plug holes along the line of the sample; but it is also readily possible to cut out the intervening or undrilled rock remaining between the holes, as well as to cut out all corners, so that, when completed, the channel may be considered as fairly regular and uniform. Greater speed is obtained in using the stoping machine in cutting overhead samples than in using the jackhamer on a face sample, but more care is required to prevent the inclusion of pieces of extraneous ore or rock that might fall from the roof.

The accumulated muck or dust sticking on the walls and roofs of the workings to be sampled was first cleaned off with water under pressure, and also with a broom, and all loose pieces of rock or ore were knocked off.

The portion of the face to be sampled may be further cleaned by drilling a preliminary channel, say about half an inch deep. In the work described the preliminary channel was not cut, owing to the hardness of the rock and the limited time available.

Two pieces of canvas, each about six by eight feet, were then laid down on the floor of the level, in such a manner that one piece overlapped the other several inches. Two pieces were used instead of one large piece of canvas, because they are more easily handled. The area of the canvas should be sufficient so that all of the drillings, say from a 5-ft. sample, can be caught on it, thus avoiding any loss of time that would otherwise result if the canvas had to be moved before the completion of the cutting of the sample.

Though it is possible for one man to operate the jackhamer without a support, it is advisable, particulary in hard rock or ore, to use two men and to furnish a support for the drill, as it is not as tiring, and a greater amount of work and a higher degree of accuracy will result. Two supports were used at different. times. One was a short piece of ladder and the other a cross-stand. The stand was made of two pieces of 2-in. pipe about 4 ft. long and two pieces of 2-in. pipe about 6 in. long, screwed into a 2-in. cross, forming an X, in which the two longer pieces were the legs of the stand and the two shorter pieces on top formed the saddle or crotch, in which the jackhamer was placed in an approximately horizontal position, and at right angles to the plane of the stand. Elbows should be screwed on to the lower ends of the legs, as otherwise the sharp edges of the pipe will cut through the canvas.

The cross-stand support, with the longer lengths of pipe down, was placed on the canvas parallel to the wall, and the jackhamer was then placed in the upper crotch between the short pieces of pipe, at such a distance from the wall that the drill-bit would rest at the rock or face.

The driller operated and directed the jackhamer with the assistance of the helper, who at times was required to hold the drill bit at the working face when starting a cut. In addition, the helper had at all times to hold a sack saddled over the drill and against the face, covering the channel sufficiently above and below, so as to prevent the chips and drillings from being lost through flying or scattering off the floor canvas. The sack of cloth was about 12 by 16 in. in size. On one of the longer edges a light stick was nailed, and from the other long edge of the sack a cut or slit was made at right angles for about 8 in. and toward the edge on which the stick was nailed, so that when held horizontally and lowered over the drill, the sack would saddle the drill and permit it to be operated through the slit, the sack covering the face of the rock or ore being sampled. It serves the purpose of a buffer, against which the chips and drillings strike, and then fall to the floor canvas.

The holes in the ends of the drill bits may be plugged with wood, so as to decrease the amount of dust, and possible loss therefrom. The cross bit has the advantage over the Carr bit, at least when starting a cut, but both kinds were used, as some of the crew preferred the Carr bit, whereas others preferred the cross bit.

Boiling and Condensing of Ammonia and of Water

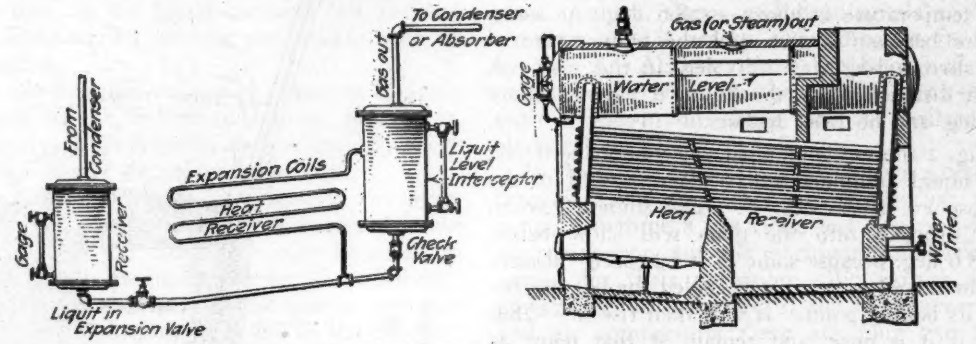


FIG. 1—COMPARISON OF STEAM BOILER AND REFRIGERATING SYSTEM.

THE following interesting and suggestive article by Mr. John E. Starr, Consulting Engineer, Starr Engineering Company, New York City, we reproduce, somewhat abridged, from the July 22 issue of *Power*. The phenomenon here so lucidly explained should be of interest to all students of air compression problems.

The average engineer is familiar with the operation of the solid, liquid and gaseous states of water. That is to say, he quickly grasps the behavior of that substance in its solid, liquid and gaseous states, ice water and steam; and many are acquainted with its state as superheated steam.

It seems well, then, in handling more volatile liquids, as ammonia (NH_3), CO_2 and SO_2, to regard them as we do steam except that they have lower boiling points, and to cling to this analogy. Let us get it into our heads that refrigeration is the reverse of steam heating and keep to this idea, and at once many of the apparent difficulties disappear.

Keep in view that in steam heating we take a liquid (water) and by adding heat to it we produce a gas (steam) which we convey to a cool place, and by condensing it (as in radiators) we give out heat or warm that place; or by condensing it and so reducing its volume to water volume, or allowing it to escape to a lower pressure, we produce power, and in so condensing it we bring it back to water and repeat the process.

In refrigeration we take a liquid (say anhydrous ammonia, or NH_3) introduce it into a warm place (warmer than the boiling point of the NH_3) and *take up heat*, changing the liquid to a gas. By adding heat to this gas in the shape of power, we put it into a condition where heat can be taken out of it by the condensing water and so reduce the gas to liquid, and repeat the process.

In a sense, therefore, the expansion coils may be likened to a steam radiator *reversed*. In a broader sense, where large quantities are handled, the expansion piping may be likened to a steam boiler, and the analogy is a little closer if likened to a water-tube boiler.

If you took a glass two-thirds full of water surrounded by atmosphere and applied heat to bring its temperature to 212 deg., or over, you would expect it to boil and finally "boil away" into a gas (steam). You would expect that about all the heat would go into the water and that you could not add much heat to the *steam*. That is to say, if the upper part of the glass was the same temperature as the lower part—212 deg. F.—then the upper part would be at the same temperature as the lower part.

Now, take the same glass and pour it slowly two-thirds full of anhydrous ammonia. Surround it with a temperature of 28.6 deg. F. below zero. It will boil from a liquid to a gas just the same as water did, and the whole glass will be at —28.6 deg. F. But suppose you surround the glass with a temperature of say 70 above zero. The lower part of the glass, or up to and a little above the liquid level, will still be —28.6 deg. below zero and will accumulate frost on the outside, because it freezes the moisture in the air; but from a little above the liquid level there is no frost, and the glass, while at a little below temperature of the surrounding air (70 deg.) is not frosted. Why? Because although the gas left the surface of the liquid at —28.6 deg., it became rapidly warmed by the surrounding air at 70 deg. and soon above the liquid level the gas received enough heat through the glass from the air to warm it from —28.6 deg. to above 32 deg. or freezing, and no frost appeared near the top of the glass.

A little heat warms up a lot of gas from —28.6 to 32 deg. while the same amount of heat will boil off some liquid ammonia *at* —28.6 deg. Therefore, wherever the heat goes into the *liquid*,

the temperature is —28.6 deg. at atmospheric pressure; and where the heat goes into the *gas,* the temperature is above —28.6 deg., or somewhere between —28.6 and the temperature of the surrounding air, +70 deg. in this case. A short distance above the liquid it rises to above 32 deg. and no frost appears.

Fig. 2 shows about what you would see if you put liquid ammonia into a glass exposed to the atmosphere at 70 deg. F. The ammonia when first dropped into the glass will show below —28.6 deg. because some of it has been "absorbed" or mixed with air and cooled the balance below its boiling point. It will then rise to —28.6 deg. if it is pure, and remain at that point as long as a drop remains. Frost will appear wherever the liquid touches. Shortly above the liquid level the gas would show progressively warmer, and just above the level it would show above 32 deg. and the moisture in the air would not freeze on the outside of the glass.

It is now fairly plain why you would not apply fire *above* instead of below the water line of your boiler. No steam would be made. If you did apply some heat below the water line and some above, all that the heat applied *above* would do would be to superheat the stream and you could get only a small amount of heat through a square foot of steam space surface, while you could get a large amount through a square foot of water-wetted surface, for in the latter case you would be changing a liquid to a gas (great increase in volume) while in the former you would only slightly increase the volume at the same pressure. If you filled the glass with ammonia gas instead of liquid, it is plain that you would not get much refrigeration. So we come to the point.

Look after the receiver and be sure you are feeding only liquid, and no gas to the expansion coils.

You can be sure of this only by looking at the gage-glass on the receiver and being sure that the liquid is always in sight and the expansion valve always flooded; also see that little or no heat is added to the pipe between the receiver and the expansion valve. Do not go by "sound" at the expansion valve. The writer can testify that after listening to expansion valves off and on for 30 years he cannot tell by the "sound" whether nothing but liquid is going through or whether 10 or 15 per cent. of gas is mixed with it.

An instance is recalled in Texas where an operating engineer had for 12 years allowed 10 to 30 per cent. of gas to go through with the liquid because his gage-glass was shut off and he was operating the valve by "sound." The loss in coal represented $43,800 in the period.

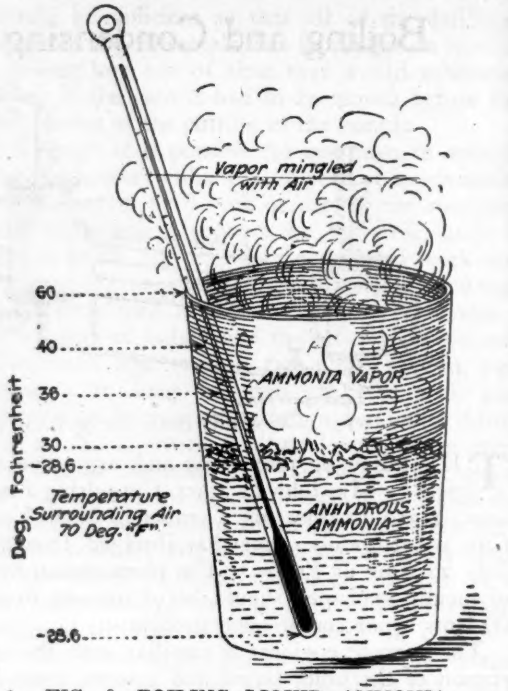


FIG. 2—BOILING LIQUID AMMONIA.

The similarity of a well-designed evaporating ammonia system to a water-tube boiler is illustrated in Fig. 1.

In case of ammonia the heat is received into the evaporating coils, which are full of boiling liquid. The "interceptor" catches any liquid that may "slop over" or be temporarily projected forward mechanically and keeps coils full all the time.

Any irregularity in feed is corrected by the "interceptor," and the liquid is returned to the expansion coils. If liquid is always in sight in the receiver and at about the same height (slightly above the level of the top expansion coil), the system is doing all it can.

So if water is supplied steadily at the feed pipe and kept at the same level in the gage-glass of the drum the steam boiler is doing all it can if in both cases the pipes are clean.

The "disengaging" surface (where gas leaves liquid) in both cases must be ample or the liquid will "foam" or be carried forward to either the compressor or absorber in the case of ammonia or to the engine or heater in the case of steam, where it will do no work and may do harm.

The check valve prevents the gas blowing both ways and insures a coil full of liquid. Some prefer to feed into the top of the interceptor and so allow the gas formed to cool the liquid from condenser temperature to evaporator temperature and pass directly to the compressor. This gas, usually 15 per cent. to 18 per cent. by weight,

does not mix with gas formed in the coils. The coils are therefore a little more effective per square foot, as the liquid contains less gas and more liquid-wetted surface per square foot of pipe surface.

It is obvious that we would not want to apply heat only at the interceptor, so we insulate it. Neither would we want to apply a fire *only* above the water-line of the steam boiler.

Now, the importance of watching the gage-glass of the receiver is plain, for although the liquid level in the interceptor may be constant, in a pipe system the liquid may be "shoved ahead" by gas and the first part of the system may contain a large proportion of gas and be less effective.

REORGANIZATION OF THE BUREAU OF MINES

Dr. F. G. Cottrell, chief metallurgist of the Bureau of Mines, who became a national figure through the invention of the Cottrell process for utilizing smelter fume by extraction of arsenic and various other commercial chemicals from the escaping noxious gases, has been named Assistant Director in charge of all investigative and scientific work. F. J. Bailey, for years Chief Clerk of the Bureau, becomes assistant to Director Manning in charge of executive work. J. E. Spurr, who at the outbreak of war became Director of War Minerals Investigations, and after passage of the War Minerals Relief Bill was appointed chief of investigative work in connection with relief claims, has resigned to become editor of the *Engineering & Mining Journal* of New York. No successor to Mr. Spurr has been appointed. H. E. Meyer, Chief Clerk of the War Minerals Relief Commission, has been appointed Chief Clerk of the Bureau of Mines, and C. P. Robertson succeeds Mr. Meyer.

EIGHT SHIPS FOR U. S. STEEL TO BE BUILT AT CHICKASHAW

The United States Steel Corporation, it is announced, is to build eight 10,000-ton steel steamships at the Chickashaw, Ala., yards of the Tennessee Coal, Iron & Railroad Co., one of its subsidiary companies. Steel for the ships will be fabricated at the Fairfield Works of the Tennessee company and routed directly over to the ways of the Chickashaw shipyards. The shipbuilding plant consists of six berths, with a gantry crane for each to swing materials from barges in adjoining wet basins alongside or aboard the hulls.

Material requiring local fabrication is to be delivered to the plate shop's receiving yard at Chickashaw. The plate fabricating shop has two main aisles, each 400 feet long and 80 feet wide served by overhead travelling cranes, and containing angle and plate heating furnaces, punches, plate, planers, shears and bending slabs. The template shop is nearby, a building 61 ft. 6 in. by 300 ft. Also nearby is the brick and steel power house, which in the main is 70x250 ft., with a lean-to on either side for boilers and electrical equipment.

In the power house are installed two 4,000-kw. 60-cycle turbo-generators and condensing apparatus, and three 8,500 cubic feet Ingersoll-Rand air compressors and the machinery auxiliaries required for their operation. To furnish steam power for the operation of the turbo-generators and air compressors there are four 750 h. p. Badenhausen water-tube boilers.

The shipways are designed for side launching of steel cargo vessels, the permanent staging being of steel construction. At the present time there are four 9,600-ton craft on the ways. Construction of six other ships is soon to be begun.

OXY-ACETYLENE TORCH RESCUES A BOY

One of the popular amusement devices at Rockaway Beach, N. Y., is known as the "Witching Waves," the witching of the waves being operated by machinery. A boy, in some way unexplained, crawled under the waves and was caught by what is known as the left arm rocker. This carried his body up against the bottom of the sheet steel wave, clogging the machinery which stopped and held him.

When his cries were heard the fireman were called. The captain tried to pry him loose and then started to chop the machinery to pieces without accomplishing much. An acetylene cutting torch was brought, the steel was cut apart and the boy immediately released, seriously but not fatally injured, although it was thought that he would have died without the help of the oxy-acetylene.

A recent British invention has been made whereby the piston of an internal-combustion engine may be cooled by means of a draft of air circulating through a space in the piston. The draft is provided by means of fan blades on the engine flywheel. On either side of the hollow piston are ports which register with corresponding ports in the cylinder walls at the end of the stroke. A draft of air is thus forced through the hollow space in the piston while all the ports are in line.

F. G. Cottrell, the assistant director of the Bureau of Mines, has returned from an extended stay in Europe, where he made an investigation into the general mineral situation existing there.

America's Future Shipbuilding Market

An Interview with R. H. M. Robinson, formerly Head of the Design and Construction Division of the United States Navy, Authority on Super-dreadnoughts, Destroyers and Submarines, now President of the Merchant Shipbuilding Corporation, Independent Steamship Corporation, the Deselektro Co., etc.

NOTE: *In the course of the war the American companies engaged in the supplying of air compressing machinery, riveting hammers and other pneumatic equipment, did a large business with the great shipbuilding plants. A large percentage of the air equipment installed in the yards is still in active use, and in future there is a likelihood that both old and new equipment will continue to be essential requirements in keeping pace with shipbuilding needs.. This much is to be gathered from Mr. Robinson's expressions of opinion on the general situation.*—THE EDITORS.

By FRANCIS JUDSON TIETSORT

TO GET an hour of the time of R. H. M. Robinson, who is among the busiest men of the world's metropolis, one's subject for discussion must arouse his compelling interest. The subject of which he is peculiarly and particularly master, that of the construction of ships, induced him recently to express for publication in these columns his ideas on the topic of the position in which America finds itself with reference to the shipbuilding market.

Mr. Robinson discovered very early in life his predilection and bent for things maritime and naval and decided to make the sea and its affairs his profession. Born in Ohio forty-four years ago, he was graduated from the United States Naval Academy at Annapolis in 1896, completing a postgraduate course two years later at the University of Glasgow. Up until 1902 he was an assistant instructor in the Navy, stationed at the famous Philadelphia yard of Cramps. He was assigned to the New York Navy Yard at Brooklyn in 1902, where he had the distinction of supervising the construction of the battleship *Connecticut*.

Three years afterward, in 1905, his career as a naval expert actually began. It was then that this young man was sent to Washington to become the Assistant to the Chief Constructor of the Navy, in which post for a period of eight years he had charge of the Design and Construction Division in building America's ships of war. In this highly important position he designed our modern battleships, superdreadnoughts, cruisers and destroyers, adding many of their present salient features. His designing and carrying out of the revolutionary idea of the "basket mast" for battleships, made him famous in naval construction circles throughout the world.

Lieutenant Commander Robinson resigned from the service in February, 1915, to become the managing director of the Lake Torpedo Boat Company, in which position he remained until 1917, when he was selected to guide the interests of several great private shipbuilding interests. He is today President of the Merchant Shipbuilding Corporation, President of the Independent Steamship Corporation, and President of the Deselektro Company, the latter a selling and negotiation branch for several large American industries.

He is a member of the University and Engineers clubs, New York City; the Rockaway Hunt; Markham Club, Philadelphia; Army and Navy Club, Washington, and many other clubs and societies. He is too busy a man to go in for sports much, but he is very fond of swimming, a rather unusual attribute of a naval man, and indulges himself in this refreshing exercise whenever opportunity offers.

But Mr. Robinson's time, energies and consuming interest are taken up with shipbuilding problems, and when the subject of the state of the market, present and future, was broached, he declared with conviction:

"I believe there is a deficiency of tonnage."

He explained first of all that he had investigated the curve of tonnage afloat and had taken account of the normal rate of increase. He had also considered the curve of increased production and he had found that it was unlikely these curves would cross before 1927. He was not positive that either the normal increase curve or the production curve would in future proceed on the same angle they had shown prior to 1914. This, he felt, depended on world conditions as affecting production and consumption, such as labor, sporadic Bolshevik outbursts, the vagaries of exchange, and unsettled trade circumstances.

"As to the future of shipbuilding in the United States," he observed, "I pretend to be no seer, but I do hold that it will be affected by world

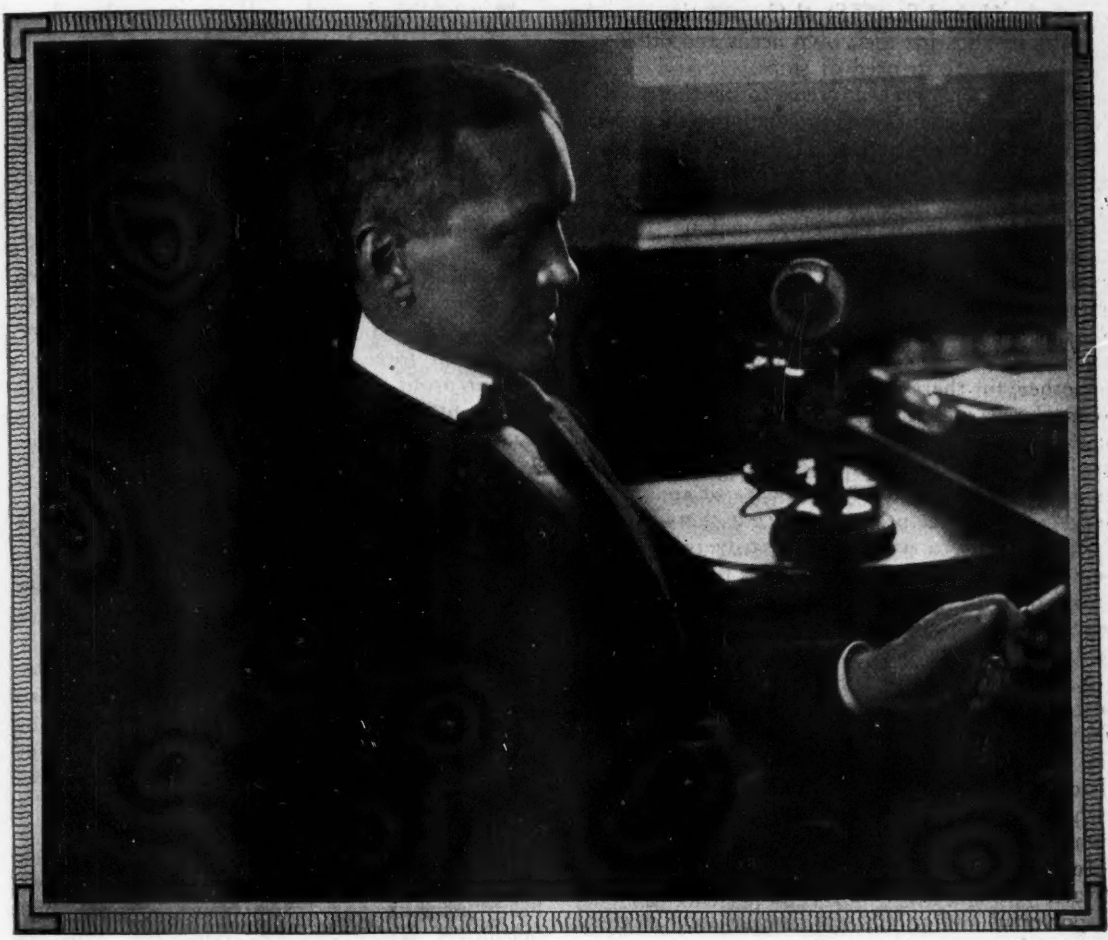


Photo by Compressed Air Magazine Illustration Service.
R. H. M. ROBINSON AT HIS DESK IN NEW YORK

conditions—by conditions without the United States. Factors that affect us in a domestic sense are the costs of building as compared with the costs of building in the rest of the world. Naturally our builders will have the inside track in building for American account, but when we compete with the world in building tramps we must be able to do it in terms of materials and labor.

"I view it as possible that we shall be able in the United States to build partly for foreign account for the next few years while the foreign yards are still booked up with their own needs. We may be able to get some Scandinavian and other 'neutral' business. Meantime, however, the exchange market greatly affects the situation, and while the needs of Europeans are great, their financial situation seems desperate.

"The greatest demands of America during the war have been for standard cargo-carrying ships of from 5,000 to 9,000 tons' capacity and making from ten to eleven knots. I do not believe that there will be a continued demand for this class of ships here if the Emergency Fleet Corporation adopts a proper policy of sales. If they will let private American owners buy at properly adjusted prices then this country will have more than enough of this class of ships for its present requirements.

"We are deficient in our supply of passenger ships, and have practically none except the seized German tonnage. We also have an insufficient supply of tankers for the present oil needs of the country to say nothing of taking care of the vastly increased oil requirements of the future.

"The United States also is in great need of several types of special ships, such as ore ships, colliers and lumber carriers. The Bethlehem Steel

and the United States Steel Corporation are now building ships for their own needs and other steel companies are in need of ships.

"For several years it seems to me there will be activity in the shipyards in supplying the demand for these specialty ships. Then we shall also require what are designated as 'intermediate' ships, those carrying both freight and passengers, besides strictly passenger ships making fourteen knots and up. On the subject of passenger vessels I believe it should be said, that in their construction, designs must be followed that suit them for particular routes. A ship that will answer very well in one service will not answer at all in another, for there are many elements that must be considered, such as length of haul, availability and price of fuel, and classification of traffic. These points, while obvious to the shipbuilder and steamship line manager, are not always so apparent to the less technical promoter. First there must be a decision as to where the passengers are to be carried and as to what route is to be covered; then the ships must be designed for this special service, with time elements taken into consideration."

Mr. Robinson observed that he had left out of calculation, in enumerating the possibilities for building, the coastwise service, which was sure to be developed further to a considerable extent. He had also passed over the matter of navy building, which he was sure would continue, no matter what views might be read here and there in print. He is a believer in the theory that the United States will maintain its safety and prestige with a powerful and an efficient navy as long as there are navies.

The preceding were Mr. Robinson's ideas on the possibilities of the future market for shipbuilders. As to the present state of shipbuilding industry he declared:

"My own belief is that the shipbuilding business in this country is over-expanded. Yards now in the field comprehend several classes of concerns: first, those that are old line established corporations that have been strengthened with accessions of capital; next, the strong new concerns which are expecting to stay in the business; then, the new companies that have not proved to be strong enough and that will be obliged to get out of the game, and finally, those that never expected to stay in the business, but which went in to get some of the cream and are now quitting the field.

"The shipbuilding business was of course enormously expanded in this country because of the necessities of war and the resultant activities of the Emergency Fleet Corporation. The outcome of it all will be, in my opinion, that the old established yards will be strengthened and stiffened in their position and that a few of the strong newcomers will stick in the field.

"The so-called 'agency yards' such as Hog Island, with its fifty ways, are strong enough, but it does not seem reasonable to believe that the Fleet Corporation can keep the entire fifty ways running. I do not believe that this will prove possible. To sum up it seems reasonable to assume that productivity in American hulls will be considerably reduced and that general capacity of yards will soon be lowered. Then, if we can produce on a fairly economical basis in competition with foreign yards and permit ourselves a decent profit, it will be a matter of the survival of the fittest among those American shipbuilding companies that elect to remain in competition with each other."

THE AIRPLANE AS A PACKHORSE

The feasibility of transporting machinery and supplies by airplane to the numerous gold and silver mines in the States of Sinaloa, Mexico, is to be investigated by the British government, according to an article in a recent issue of *Commerce Reports*. According to the story, it appears that a British company is prepared to organize and operate an air service between the mines and railway stations for the transportation of machinery and supplies to the mines, which, due to their mountainous location and the absence of roads, at present are practically isolated. At present it is practically impossible to transport heavy machinery to these mines and the only machinery which can be transported must be carried on the backs of burros, whose maximum limit of carrying is about 300 pounds each. It is understood that it would be the purpose of the proposed company, to transport machinery weighing several tons.

It is often an advantage about a plant to have concrete harden quickly. The Bureau of Standards has developed a method whereby the rate at which concrete increases in strength with age is accelerated by the addition of small quantities of calcium chloride to the mixing water. Tests show that the best results are obtained when from 4 to 6 per cent. of this material—by weight—is added. While no deleterious effects on the durability of plain concrete thus treated have been indicated, on the other hand we are warned against the unrestricted use of this salt in reinforced concrete. Corrosion of ordinary reinforcing takes place in concrete treated with calcium chloride, where this concrete is exposed to weather or water.

Correlating American Speed and French Precision

By LESLIE NEWTON HILDEBRAND

"WHAT can I learn in this country?" was often the contemptuously asked question of the American soldier who read on a bulletin board in a Red Cross recreation hut an announcement of an educational tour to visit some of the various industries of France. Visits to industrial centers and manufacturing plants were fostered by the American Red Cross after the signing of the armistice with the joint purpose of giving education and recreation to the American soldier.

First attempts to give the soldier an insight into French methods of manufacturing were received with some contempt by the average American, aspecially one whose knowledge of France was limited to the war-torn regions over which he had fought. But eager for anything in the nature of a change, he took the trip and returned with a new idea of the industrial development of the country in which he had spent many months as a soldier.

Although France is essentially a farming country, manufacturing and industrial activity forms a large part of the business of France. In the wine growing country of southern France, farming and manufacturing goes hand in hand and each big estate has its vineyard and its factory.

Here the American soldier found machinery made in the United States furnishing the power to press the juice from the grapes and later to bottle them ready for storage or shipment. What the American could not understand was the up-to-date machinery making the wine, and the slow, lumbering oxen doing the plowing. This, the overseer would explain, was due to the fact that the peasants insisted on employing the methods used by their great-grandfathers and a shift to horses, much less to tractors, would cause all of the workmen to leave and go to some nearby farm where they could work in the same manner they always had.

That much of this prejudice against changing old methods will be overcome by the reconstruction which necessarily follows the war, is the opinion of many far-sighted Frenchmen. French business men realize that in re-establishing the devastated regions, the most efficient machinery must be used and there will be no opportunity to go back to many time-honored but less productive methods.

The wine industry was not the only industry the American soldier found in France. Many trips were made to Lyons to visit the big silk factories, known throughout the world. To the casual visitor unfamiliar with manufacturing methods, these trips were interesting because of the fame of the plants. The man with a knowledge of machinery, on the other hand, found in them dozens of ideas of which he made mental note for reference when he returned to the United States.

True, the speed of the American factory was lacking. Two hours for dinner seemed like a waste of time to the practical American. But overlooking this, the soldier saw, at each turn, the French regard for efficiency and minutest detail in each part of the great factories.

Dijon has an establishment that illustrates the French business characteristics. Going under an archway, through heavy bolted doors and along a courtyard, one may find a book printing house. The building looks like a mediaeval mansion kept in good repair, perhaps for the benefit of the tourist. Inside is one of the most up-to-date printing and book binding establishments in France. The proprietor, who speaks both French and English, explained to American visitors that this establishment was founded by his great-grandfather. Later his grandfather conducted the place, then his father, and now he, a middle aged man, is training his son as his successor. The machinery, as it wore out, had been replaced with new material, and none but the latest designs of machines could be found in the shop, yet the building had not been changed since the plant was established more than a century ago.

Here again the American found some things to wonder at, as well as some to praise. Why the front door should be locked and it be necessary to ring a bell to enter the office was unexplainable to the soldier who was used to business methods of the United States. When, also, he was finally shown into the office he wondered if he had made a mistake and drifted into the drawing room of the proprietor's home, so elegantly was it furnished. In this office, too, the proprietor was never too busy to sit down for half an hour or more and talk to an American soldier, to show him the latest piece of fine work, or take him to see any machinery in which he was interested. When the soldier inspected the plant and the products turned out, he was forced to admit that the method of doing business was successful, in France, at least.

Although millions of dollars' worth of machinery was destroyed by the German invasion of northern France, at least one industry is still intact. Pont-a-Mousson, before the war, claimed

to produce more lead pipe than any other city in the world. When the German army obtained a foothold on three sides of the city, the inhabitants were ordered to leave. Both armies, hoping to keep the town undamaged for themselves, kept their soldiers out and thus saved the town from shelling. When the armistice was signed, this town remained, surrounded by ruins, undamaged except for a stray shell here and there.

Other factory towns of this region were not so fortunate. Millions of dollars will be necessary to replace the machinery destroyed and carried away by the German army. France, according to many French business men, must obtain this machinery from the United States. France cannot produce it quickly enough, neither can England. The American Red Cross is greatly assisting France in this respect, having authorized an expenditure of 87,000 francs on machinery to harvest the crops in the liberated areas.

The Frenchman cannot understand the American's haste any more than the American can understand the dislike of the French to change existing manners and customs. Perhaps the American doughboy, with his knowledge of French business methods gained on Red Cross educational trips and his knowledge of the French temperament procured by months of living in French environment will help correlate the American business speed and French precision.

MINING ENGINEERS GIVE DINNER TO MR. HOOVER

HERBERT HOOVER, one of the world's great mining engineers, was greeted at a dinner given in his honor at the Waldorf-Astoria, New York City, by nearly 1,300 members of the American Institute of Mining and Metallurgical Engineers and their guests, on the evening of September 16, a few days after his return from his five years' direction of American relief in European countries. Mr. Hoover himself made a great speech and was cheered to the echo. Few men have ever heard such eulogies heaped upon themselves publicly, or heard such salvos of pent-up enthusiasm as were let loose on that occasion in the stately Grand Ball-room of that famous hostelry.

The guests voiced their admiration, respect and esteem for Mr. Hoover not only as an eminent engineer and man; as a food and general relief administrator he was hailed as having shown himself a consummate general and organizer in action. Mr. Hoover was visibly touched by the demonstration and prefaced his formal speech by the helpless inquiry, "Gentlemen, what can I say?" His modest bearing and absolute sincerity of manner had a strong appeal for those gathered to do him honor and bid him welcome home to what he had publicly declared on his arrival from Europe would be "private life."

The toastmaster of the evening, selected to pay the Institute's tribute to Mr. Hoover, was Mr. W. L. Saunders, its Past President, who is chairman of the Naval Consulting Board, and the editor-in-chief of *Compressed Air Magazine*. Mr. Saunders paid the deserved tribute in warmest terms and frequently brought the diners cheering to their feet.

When he said: "The engineer is by education and experience the true captain of industry, fitted to handle the ship of state," there was vociferous approval, the audience rising and cheering because of the suggestion that Hoover might make a presidential candidate.

Mr. Saunders extended a "welcome due an eminent citizen, a successful engineer, a genius of constructive administration, a practical economist and a statesman of world-wide vision." He told how Mr. Hoover got other men to do things and said that "his faith in the moral support of the people was sublime, yet practical."

The toastmaster declared:

"His work was not built upon precedent; there was no experience, no guide. It was in fact a creation. In the words of the Prime Minister of England, his work in Belgium was 'nothing less than a miracle.' Yet it is a fact that those who have been in close touch with the situation say that his greatest work has been done since the Armistice was signed.

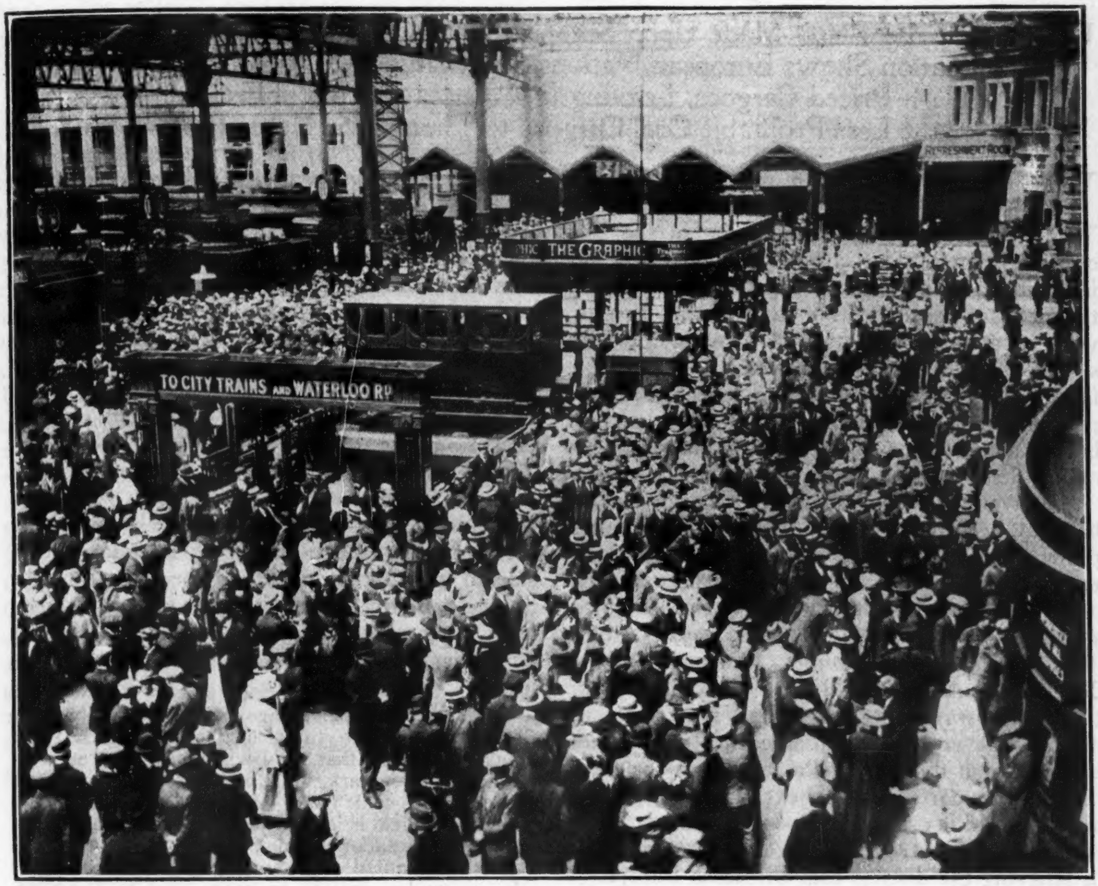
"Truly this is a period of new things, new changes, new times; a period of agitation which brings to the front new men of true worth. You who are mining engineers know what a good thing the flotation process is, how by violent stirring up of things the metallic values are separated from the gangue and float off at the top. This process has been in action all over the world during the last five years and it has revealed out of the chaos an engineer of the value of pure gold, one

> Of manners gentle, of affections mild,
> In wit a man, simplicity a child.

"A rugged personality, strong of conviction, modest; thinking never of self; practical, far-seeing, wise, human, brave; with a mind clear in action; a conscience that always functions; one who has saved lives while all others were engaged in destroying them; a rare combination of physical, mental and moral courage; a real American is this Herbert Hoover."

F. J. T.

An Episode of the Recent Strikes in England



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ENGLAND HAS BEEN IN THE GRIPS OF MUCH MORE SERIOUS STRIKES THAN HAVE BEEN INFLICTED UPON THE PUBLIC IN AMERICA. WHEN THE LONDON POLICE WALKED OUT RECENTLY AND DESERTED THEIR DUTY, THE RAILWAY MEN JOINED THEM. OUR PHOTOGRAPH SHOWS THE IMMENSE CROWDS AROUND A SUBWAY STATION THAT ARE WAITING FOR A MEANS OF CONVEYANCE TO THEIR HOMES.

A feature of the strike as pertaining to London's underground system, and reported by Capt. Thomas C. Watson in a copyrighted dispatch to the Philadelphia *Public Ledger,* was that numerous former officers and soldiers of the British Army were organized into a corps of efficient amateurs to run the trains and perform other incidental duties. Capt. Watson wrote:

"I found Majors clipping tickets, Captains ushering passengers into their right compartments and young Lieutenants sweeping the platforms of trains, being most efficiently driven by exploits of the flying corps.

"No task was too menial or too important. They led their troglodytical existence in the catacombs of London with all the cheerfulness they showed in Verdun. The atmosphere of the army in France was ever present. Tunnelled London reminded one of sectors of the battle fronts. One thought of Verdun, Gibraltar and Helgoland.

"The frontier workers were concentrated at one point and from there all sections of London's battle line were fed. Hammersmith and Earl's Court, two important centres, were organized on the lines of infantry base depots. Here they rest. Canteens, reading and writing rooms were established. A part of the stations had been converted into a sleeping room. Beds were arranged with soldierly precision, with blankets and bedding neatly folded."

Europe Facing A Coal Famine

Urgent Demand Being Made Upon Shipping Board to Forefend Distress. Analysis of Situation Shows European Nations Are Using Own Tonnage to Carry High Priced Cargoes, Leaving to America the Job of Freighting the Less Profitable Coal Cargoes to Their Own Home Ports

WITH the approach of winter the greatest menace to life in Europe draws on apace. The greatest stress and danger lies in the lack of coal. America has a boundless quantity, but incredible as it may seem, America cannot supply the need of Europe. Nor can Great Britain, with its annual production of 287,412,000 tons shrunk to 214,000,000, Germany's decline being even greater. And while Great Britain's pre-war export of coal ran to 76,689,000 tons, her estimated post-war exports are only 23,000,000 or less.

To avert a world shortage America would have to export 81,000,000 tons. The nation's pre-war export of coal was less than 20,000,000 tons. The excess over pre-war exports which must be supplied by this country, if the world shortage is to be made up, is 62,463,000 tons. This shortage cannot be met. To make up the deficiency America would have to export within the next few months more than four times as much as it ever exported in an entire year. There is not enough tonnage available. With the trebling food exports even an extra million tons a month would tax shipping beyond its utmost limit. And even that extra million would be of no avail in relieving the distress that threatens Europe.

No phase of world conditions has more closely occupied the United States Shipping Board than this matter of coal for Europe. Keenly alive to the situation, Mr. J. H. Rosseter, Director of the Division of Operations, had Mr. H. Y. Saint, head of the Export Coal Department of his division, compile the report which we present here. It portrays the abnormal demand that is being made upon the United States to take care of Europe from a coal standpoint, shows that the demand that is being made upon the Shipping Board for tonnage to be placed in the coal trade is many times greater than can be supplied, and what is more significant, shows that European nations are doing little or nothing to relieve the situation by using their own tonnage, moreover, that the nations which are doing the least are the ones that are able to do the most.

The outstanding fact, brought out by this analysis, is that European nations are using their own tonnage in trades best suited to their maritime interests and in competition with Shipping Board vessels, leaving Uncle Sam to carry the less profitable coal cargoes for the relief of suffering peoples.

"It would seem," reported Mr. Saint, "cognizance must be taken by the Shipping Board of this situation and that something should be done to bring European tonnage into this work of distributing coal to European ports. The statistics compiled by this department show that Italy is practically the only European government which is extensively using its own vessels in carrying coal from the United States for Italian relief. In the month of July, 20 Italian vessels sailed from American ports with coal. You will notice that Norwegian, British and Greek ships were plying in the Italian trade, which today is considered a profitable one. At the same time the Shipping Board was having demands made upon it to carry coal to Greece, Switzerland and the Scandinavian countries as well as to South America.

Very heavy demands are being made upon the Shipping Board to carry coal to Denmark. Our tabulation shows that no Danish vessels are carrying coal to Denmark, but a number of Danish ships are carrying coal from American ports to South America, which is a profitable trade when the return cargo situation is taken into account.

It will be noted that Norwegian and Italian vessels are under charter to carry coal to Gibraltar, when the needs in their own countries are great.

Large demands have been made upon American tonnage to carry coal to the Netherlands, and during July, 17 American vessels sailed from American ports to that country. During the same period only three Dutch ships carried coal to their home ports while two Swedish and one Norwegian ship were in the Dutch coal trade.

Insistent requests have been made on the Shipping Board to carry coal to Sweden, and as many as 11 steamships have sailed in one month for that country. Yet Swedish steamships in that trade have not exceeded one a month.

With the increasing demand upon America to supply coal for Europe and to carry it in American bottoms, and with all the demands predicted upon the increasing distress in various European countries, it would seem that immediate steps must be taken to bring about an effort on the part of the various countries to help themselves in this matter of coal distribution.

In view of the fact that the Shipping Board cannot meet the demands that are being made upon it, in view also of the fact that our vessels are now being used to relieve distress in Europe where the distress is greatest and relief most urgent, it seems imperative that the European nations which are facing a coal famine should do something to re-

lieve the situation by placing some of their own tonnage in the American coal trade, even though that trade is less profitable than the ones on which these vessels have been placed to compete with the new fleet of the U. S. Shipping Board.

From the analysis made by Mr. Saint it appears certain that the people of France, Belgium, Holland, Italy, Denmark, Norway, Sweden, Spain and Switzerland will be among the ones that must suffer most and that the shortage will fall with no less weight upon Germany, Austria-Hungary, including Czecho-Slovakia and Jugo-Slovakia. The total coal requirements of the world next winter have been placed by this authority at 179,511,000 tons, of which 97,723,000 tons can be supplied by countries other than the United States.

This would leave 81,788,000 tons to be furnished by this country. Mr. Saint estimates that there will be furnished 19,325,000 tons, leaving a shortage in the world's coal bin of 62,463 000 tons, a tonnage sufficient to supply the New England States for nearly three years. Translated into other terms, it would require 1,249,000 cars of fifty tons capacity each, to meet the shortage, or 25,000 trains of fifty cars each. Twelve thousand, five hundred vessels of 5,000 ton's capacity each would be necessary to carry the cargo across the ocean in one trip. More than 60,000 men would have to dig coal at top speed for a year to produce the tonnage.

HENRY M. ROBINSON RESIGNS FROM SHIPPING BOARD

Mr. Henry M. Robinson, whose resignation as Commissioner of the United States Shipping Board was accepted by President Wilson, closed up his desk on August 13 and left for his home in the west. It was while he was abroad as special representative of the Shipping Board that Mr. Robinson was appointed Commissioner, succeeding Charles R. Page, who had resigned. He returned from the special mission in June and had been on duty with the Board since.

At the outbreak of the war Mr. Robinson went to Washington as a volunteer war worker, and became a member of the Advisory Commission of the Council of National Defense. He was for a time Chairman of the Labor Supply Committee, and later of the Committee on State Councils of National Defense, forming the connecting link between the latter and the National Body.

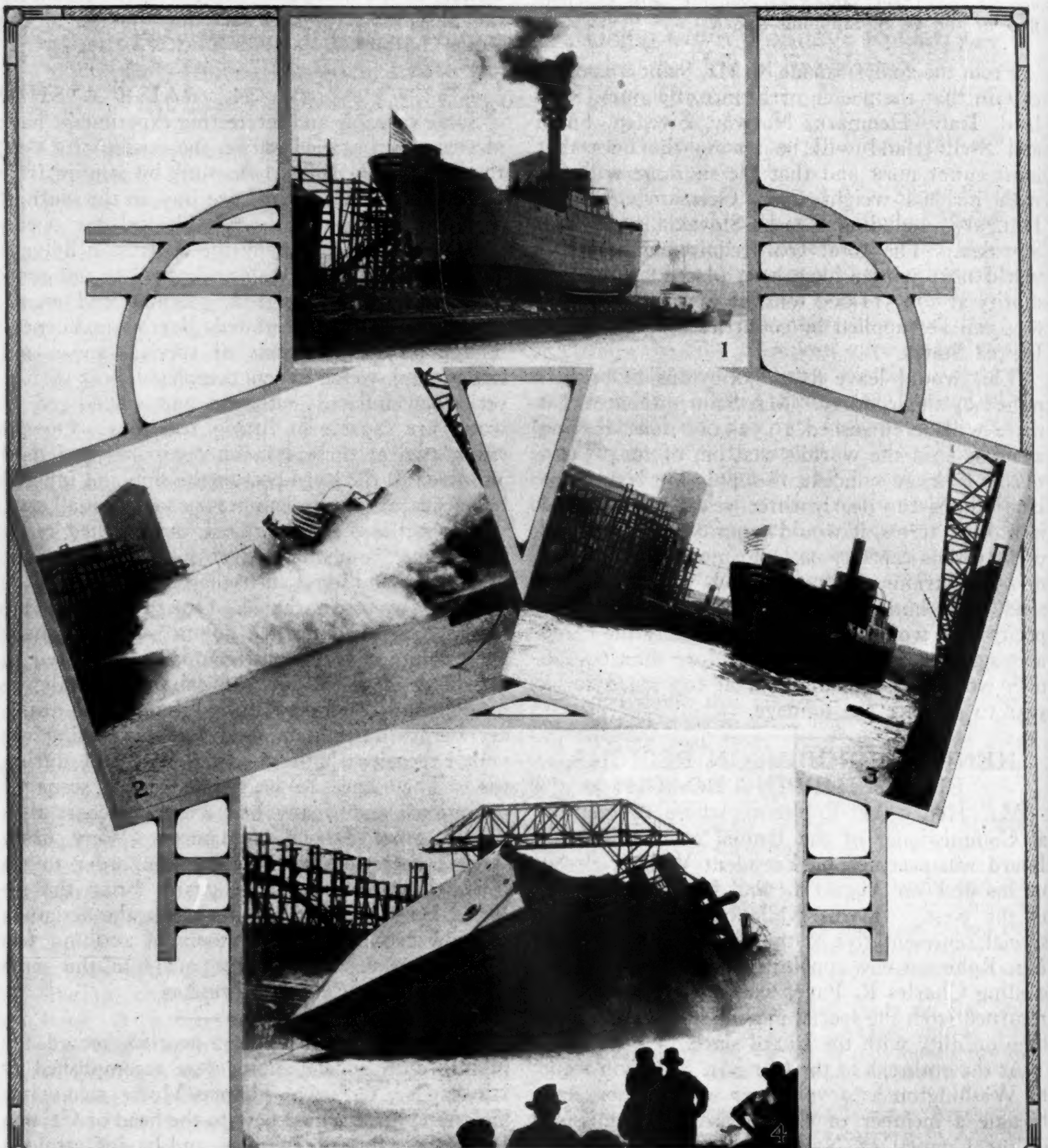
In the early fall of 1918, Mr. E. N. Hurley; then Chairman of the Shipping Board, appointed Mr. Robinson as assistant Chairman, Mr. Robinson's particular responsibilities being connected with the study and formulation of plans for the future policy of the Government with relation to an American merchant marine. Upon the signing of the armistice, Mr. Robinson assembled the Shipping data necessary for the use of the Peace conference.

CANVAS PONTOONS RAISE A SHIP

Some valuable and interesting experiments have recently been carried out on the raising of a ship, the S. S. *Main,* which was sunk by gunfire from a German submarine in Luce Bay, in the south of Scotland, during the war. The salvage operations were carried out by the Ardrossan Salvage Company, Glasgow, who undertook to test some flexible pontoons, designed, patented and manufactured by Vickers Limited, Barrow-in-Furness. The pontoons are made of special canvas and cables, and weigh when completed only 1 ton, yet when inflated with air and submerged in water are capable of lifting 100 tons. On the trials, two of these 100-ton pontoons were used and fixed to the stern-post of the ship and inflated by means of an air compressor on a small tug. The vessel was slowly raised and beached ready for pumping out on the 19th inst. The amount of rough handling which these canvas pontoons withstood was remarkable. One great advantage they possess is that when not in use they can be packed into a very small compass and stored in the hold of a salvage ship and need only be brought out when actually required. The ordinary barges or lighters used for ship lifting are very expensive, both in initial cost and during use. They have to be towed to the scene of operations, and if any bad weather occurs they are in great danger of damage. Very often salvage operations are necessary in order to recover the wrecked salvage gear. From the information gained during these tests, the designers are now confident that pontoons of 200 and 300 tons lifting capacity can be made in the same manner.—*The Engineer,* London.

What is believed to be a world's record for gliding with a dead motor was accomplished at Ithaca, N. Y., in a Thomas-Morse two-seater biplane. This machine flew to the head of Cayuga Lake, a distance of 35 miles, and having attained a height of 17,500 feet, the pilot switched off his motor and glided to Ithaca, at which point he still had 5,000 feet altitude. If his glide had been continued it is estimated that an additional 15 miles could have been covered, making a total of 50 miles without the use of his motor. The longest glide previously recorded was that of Capt. Raynham, according to *Aeronautics,* when he glided from Brooklands to Hendon, in England, a distance of 22 miles.

The Most Remarkable Launching in the History of Shipbuilding



Photos Copyright Keystone View Co.

THE *LAKE FUGARD*, WHICH WAS ONE OF THE LAST EMERGENCY FLEET CORPORATION VESSELS, WAS LAUNCHED AT THE BUFFALO DRY DOCKS WITH ENGINES AND BOILERS INSTALLED AND STEAM ALREADY UP. IT WAS THE FIRST TIME A FINISHED SHIP HAD GONE SUCCESSFULLY DOWN THE WAYS AFTER A DROP OF 23 FEET FROM TOP OF WAY. THE CRAFT TIPPED OVER AT THE EXTRAORDINARY ANGLE OF 70 DEGREES AND AIDED BY THE REBOUNDING WATER IN HER NARROW SLIP ALMOST MIRACULOUSLY RIGHTED HERSELF. A SHIP USUALLY CAPSIZES AT 60 DEGREES.

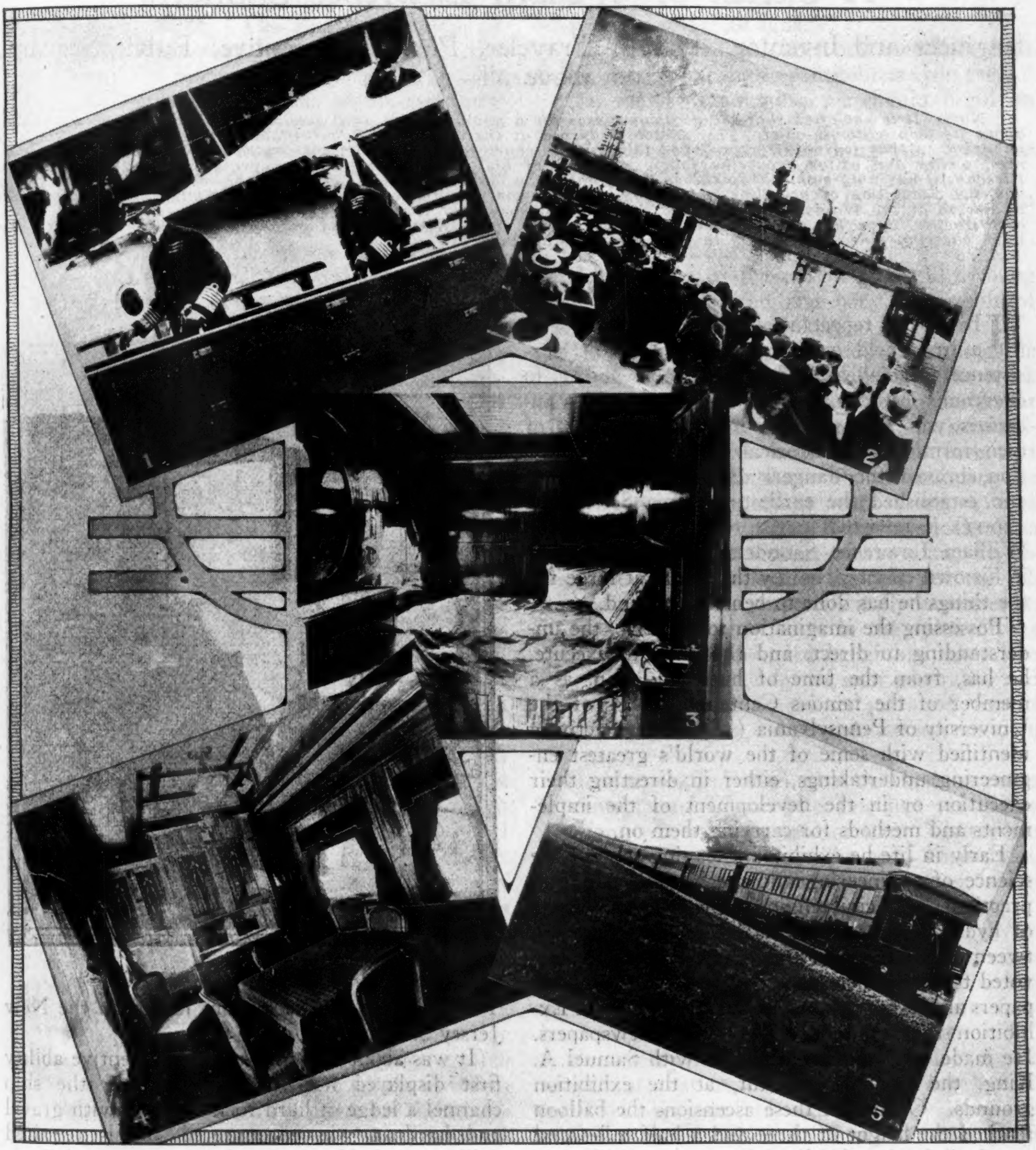
FIG. 1—THE *LAKE FUGARD* JUST BEFORE IT WAS LAUNCHED SIDEWISE.

FIG. 2—THE LAUNCH AND THE DANGEROUS ANGLE OF 70 DEGREES.

FIG. 3—THE STEAMER AFTER BEING LAUNCHED COMPLETE. WITHIN AN HOUR SHE WAS LOADING CARGO.

FIG. 4—VIEW OF THE VESSEL AS IT BEGAN TO RIGHT ITSELF.

The Visit of the Prince of Wales to America



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THE VISIT OF THE AMIABLE AND HANDSOME YOUNG PRINCE OF WALES TO AMERICA, LIKE OTHER PRECEDING VISITS OF MEMBERS OF BRITISH ROYALTY TO AMERICA, HAS BEEN AN HISTORIC EVENT. EVERYWHERE HE HAS BEEN WARMLY WELCOMED, NOT ONLY BECAUSE HE IS THE HEIR TO THE THRONE OF ENGLAND, BUT BECAUSE OF HIS WINNING PERSONALITY.

FIG. 1—THE PRINCE FOLLOWING HIS FATHER, THE KING, ON BOARD THE *RENOWN* BEFORE HE SAILED FOR CANADA.

FIG. 2—H. M. S. *RENOWN* STEAMING OUT OF PORTSMOUTH HARBOR WITH THE PRINCE ON BOARD.

FIG. 3—THE PRINCE OF WALES HAS HAD AS HIS RESIDENCE FOR TWO MONTHS A BRAND NEW AND PALATIAL TRAIN WITH A PICKED CREW OF TRAINMEN. THIS VIEW SHOWS HIS LUXURIOUS SLEEPING QUARTERS ON BOARD, LOCATED IN THE PRIVATE CAR *KILLARNEY*, WHICH WITH THE PRIVATE CAR *CROMARTY* WAS LOANED BY LORD SHAUGHNESSY. BESIDES THE PRINCE'S BEDROOM, THE *KILLARNEY* ALSO CONTAINS A SECRETARY'S BEDROOM, SHOWER BATH, DINING ROOM FOR SIX, KITCHENETTE AND CHEF'S BEDROOM. THERE IS AN OBSERVATION PLATFORM ON WHICH THREE SEARCHLIGHTS ARE MOUNTED FOR NIGHT USE.

FIG. 4—THE PRINCE'S DINING ROOM ON BOARD THE TRAIN.

FIG. 5—THE COMPLETE TRAIN, SHOWING OBSERVATION PLATFORM AND SEARCHLIGHTS.

A Sketch of William Lawrence Saunders

Engineer and Inventor, Author, Traveler, Popular Executive, Public Servant, and above all—a Man

NOTE—*It is not often that the occasion arises for a publication to print such an article as the one subjoined, about its own editor-in-chief. This sketch, prepared at the request of Power Plant Engineering, and originally published in that journal, is reproduced through the courtesy of our contemporary as a tribute to a great engineer, writer and editor, from the fellow members of his editorial staff of Compressed Air Magazine. Mr. Hirschberg has ably summed up the salient points in a career that has led to high place. Mr. Saunders lately had the distinction of presiding at the great dinner given by the American Society of Mining and Metallurgical Engineers at the Waldorf-Astoria, New York, in honor of that great mining engineer and executive, Mr. Herbert Hoover, upon his return from Europe to private life. His speech of eulogy and welcome brought the 1,300 cheering diners repeatedly to their feet.*—THE EDITORS.

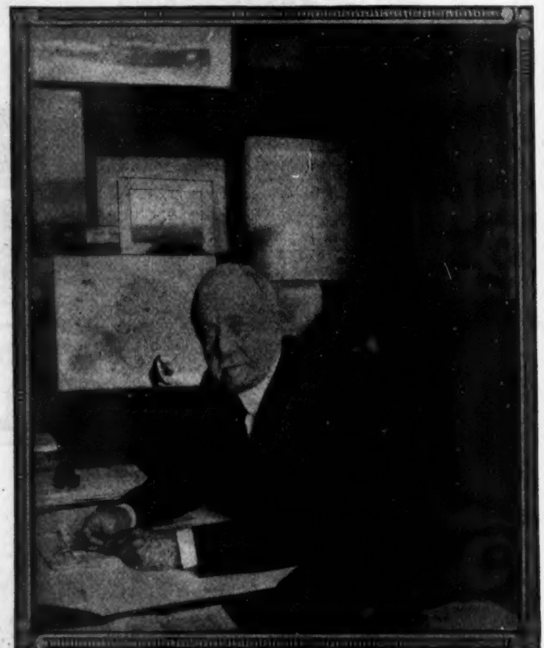
By CHARLES AUSTIN HIRSCHBERG

HISTORY repeats itself in individuals as well as in world events. The remarkable persistence, "go-ahead," determination, ability to overcome obstacles, and creative genius of his ancestors, who, as a member of that sturdy band of men forming the historical Jamestown Expedition, braved the dangers of an unknown land and established the earliest Virginia Settlement (1607) is reflected in the remarkable career of William Lawrence Saunders, known not alone in his own country, but by the world at large for the things he has done to benefit mankind.

Possessing the imagination to conceive, the understanding to direct, and the hand to execute, he has, from the time of his graduation, as a member of the famous Centennial Class of the University of Pennsylvania (1876), been actively identified with some of the world's greatest engineering undertakings, either in directing their execution or in the development of the implements and methods for carrying them on.

Early in life he exhibited a leaning toward the science of engineering and mechanics. He first practised as a civil engineer in 1878 in charge of hydrographic work, the intervening time between graduation and this undertaking being devoted to special newspaper work for Philadelphia papers and as correspondent at the Centennial Exhibition for a number of Southern newspapers. He made two balloon ascensions with Samuel A. King, the famous aeronaut, at the exhibition grounds. On one of these ascensions the balloon reached the height of three and a half miles and remained in the air all night, a remarkable feat at that time.

The years 1879-1881 found Mr. Saunders acting in the capacity of engineer for the National Storage Co. at Communipaw, N. J. He made a series of soundings in New York Bay preliminary to the erection of the National Docks on the New Jersey water front. He also had charge of the construction of piers, warehouses, docks and the ship channel, from the main New York Channel to Black Tom Island on the New Jersey Shore.



WILLIAM LAWRENCE SAUNDERS

It was about this time that his inventive ability first displayed itself. While cutting the ship channel a ledge of hard rock overlaid with gravel and hardpan was encountered. This required drilling and blasting under water, a difficult operation at that time with the implements available. To overcome the difficulties presented, Mr. Saunders made a number of personal experiments in a diving suit, which led to the invention and patenting of appliances for subaqueous drilling, which are still in fashion today and generally used.

He also invented and patented a system of pumping liquids by compressed air, used by mu-

nicipalities and power plants for water supply, and in the oil fields for obtaining the oil from the bowels of the earth. The Radialaxe system of coal mining is another invention of his fertile brain, as well as innovations covering the drilling and quarrying of rock. These inventions, along with others, called out improvements in air compressor design and the development of a long list of pneumatic machinery used in practically every industry.

Most of these contributions to the mechanical arts were made after he became identified with the Ingersoll-Rock Drill Co. (1881) in the capacity of engineer. Thus began a life-long association, now 38 years, which was to lead him through successive stages to the topmost rung of the ladder in the counsels of a large and important business. He was the first president of the Ingersoll-Rand Co., and is today chairman of the Board. He is president of the Ingersoll-Sargent Drill Co. and a director of the A. S. Cameron Steam Pump Works.

While still at college he showed ability as a writer, was editor-in-chief of the "University Magazine," and was elected class poet. This early predilection has remained with him throughout his life, and we find he is the author and co-author of a number of engineering books, scientific articles and papers on national and international topics. His work has brought him in contact not only with men of renown within his own immediate business sphere, but also with those high in the counsels of the nation. He is an admirer and warm personal friend of President Woodrow Wilson. During the late national emergency—the World War—in his capacity as Chairman of the Naval Consulting Board, of which Thomas A. Edison was President, his counsels served the country well. He stood as close to Secretary Daniels of the United States Navy as perhaps anyone.

As a lecturer and toastmaster he is well known, being noted for his ready wit, a wide knowledge of all subjects, entertaining and enlightening. He adorns whatever subject he either speaks or writes upon by the most splendid eloquence. As a business executive he is pre-eminently successful, having been largely responsible for the upbuilding of the Ingersoll-Rand Co.'s business from its small beginning to its present position.

Pressed for a statement as to what he attributed this success, Mr. Saunders modestly parried the question by laying down the following rules for success in life, which, it is to be noted, define success not merely in a materially commercial sense, but from the broad human standpoint.

"Always bear this in mind: 'Let him that thinketh he standeth take heed lest he fall.' "

"No one can live in the world without the helping hand of his associates; never forget to hold that hand for all time."

"Try to pick out good men and then back them to the limit by putting responsibilities upon them."

"To remove mountains, we should begin on grains of sand."

"If you can't do the best thing, you should be glad to do the next best."

"There are greater things in the world than money."

"Work till it hurts."

Mr. Saunders at the age of 62 is still a young man in vigor of mind and body, the result of right living and right thinking.

He is the imitator of no one. The things he has done and is still doing all bespeak the work of a master mind. A firm believer in the power of publicity for good, when applied in a meritorious cause, he prides himself on the fact that in his earlier association with the company he carried on this important work along with a multitudes of other duties. He always looks upon things from the standpoint of the man; he believes that the man makes the job, not the job the man, or, as he characteristically expresses it, "The value of every job is in the value of the man." This well-founded belief has made him a keen student and judge of men generally, and as a result he has been able to surround himself with men of ability, thereby enhancing his own success.

He is an inspiration to all with whom he comes in contact, and is noted for his just yet kindly decisions. It has been said of him "That when satisfied the cause is just, he will hazard all, wherever it may lead." A firm believer in humankind, he always sees the good in everyone.

Mr. Saunders, previous to the World War, was an extensive traveler, accompanying a number of scientific expeditions, and his contributions to engineering literature are based upon first-hand investigations.

He is so versatile that Dryden's words, "A man so various that he seems to be, not one but all mankind's epitome," fit him well.

Following is a brief sketch of his life and the things he has done. It evidences the confidence displayed in him by all with whom he has come in contact, and forms a true expression of the "value of the man."

He was born November 1, 1856, at Columbus, Ga., the son of William Trebell Saunders, D. D., and Eliza Morton Saunders. He received the degree of Bachelor of Science, University of Pennsylvania, in 1876, and of Doctor of Science, 1911. Mr. Saunders is now a director of the American International Corporation, president

and director Muhlenberg Hospital of Plainfield, N. J.; director American Manufacturers Export Association, director Federal Reserve Bank of New York. He is a member of the District Committee on Capital Issues of the Federal Reserve Board, New York Chamber of Commerce, U. S. Chamber of Commerce, New York Foreign Trade Council, National Civic Federation (Chairman of the New York Welfare Committee), National Democratic Club, Executive Committee, League to Enforce Peace, and chairman Nicaragua Permanent Pan-American International High Commission. He was appointed by President Wilson as a member of the New Jersey Harbor Commission, and is associated with the New Jersey Board of Commerce and Navigation. He was nominated by the American Institute of Mining Engineers and appointed by the Secretary of the Navy as a member of the Naval Consulting Board of the United States and served as chairman. He was also a member of the Advisory Board, United States Fuel Administration for New Jersey. Formerly a member of the New Jersey State Democratic Committee, he was also President Wilson's personal representative from New Jersey on the National Campaign Committee in 1916. He was twice elected mayor of N. Plainfield, N. J.

Mr. Saunders is a past president and director, American Institute of Mining and Metallurgical Engineers, and a director, formerly president, Machinery Club; also director, India House. He is also associated with the University of Pennsylvania Club of New York (President and member of the Council), Aero Club, Engineers' Club, University Club, American Society of Civil Engineers, American Society of Mechanical Engineers, Mining and Metallurgical Society of America, American Iron and Steel Institute, United Engineering Society (trustee), American Academy of Political and Social Science, Philadelphia, the Academy of Political Science in the City of New York, and of the American Geographical Society.

He is editor of *Compressed Air Magazine*, author of "Compressed Air Information," "Compressed Air Production," co-author of "The Subways and Tunnels of New York" and "Rock Drilling." Among his numerous other publications are: "Compressed Air, Its Production, Transmission and Use," "A Practical Consideration of Compressed Air," "Quarrying by the Channeling Process," "The History of the Rock Drill," "Rock Drilling Economics," "Tunnel Driving in the Alps," "Right and Strength in Equal Suffrage," "Reveries of a Business Man," "Business and Politics and the Anti-Trust Laws," "Government Regulation of Commerce as Affecting Foreign Trade," and "Compressed Air in the Arts and Industries" for the International Engineering Congress, San Francisco, 1915.

INTERNATIONAL STANDARDS

The American Engineering Standards Committee gave a dinner—its first recorded function—on Sept. 18, at the Engineers' Club, New York, in honor of Mr. Charles LeMaistre, Secretary of the British Engineering Standards Association. The dinner was attended by more than fifty engineers representing practically every organization interested. Mr. LeMaistre gave a highly interesting address, speaking of the high ideals of the British Engineering Standards Association and of the good work already accomplished.

"The B. E. S. A. was formed," he said, "in 1901 at the instance of Sir John Wolfe Barry, the dean of our engineering profession, and it was through his able guidance during some sixteen years of the most important period of its existence that the Association gradually gained the confidence of the people. We are now an organization of some three hundred committees"—just think of it "and twelve hundred members who give their time fully to the work.

"We realize more and more that standardization is, shall I say, 15 per cent. technical and 85 per cent. human. Standardization is an industrial matter and it is the industry that should put up the standards and get the help of the engineers and experts to support them.

"Standardization means efficient production. It can only be effective when overlapping is avoided. Overlapping can only be obviated by the operation of some central organization, which we have provided in Great Britain with wonderful effect. We find now that overlapping of effort is becoming less and less each year, and the B. E. S. A. is becoming more and more recognized as the central authority for drawing up standards for the engineering and allied industries

"If only we could get coördination of standardization on both sides of the water, one central authority on each side, it would not only help our industries enormously, but we could work hand in hand on these technical problems which involve this complicated human factor, and in doing this big work we would surely be no mean influence in promoting the peace of the world."

Following Mr. LeMaitre's address the representatives of the various organizations pledged their support of the contemplated development of the American Committee. Dr. S. W. Stratton, Director of the Bureau of Standards, reiterated the readiness of the Government Deportments to coöperate in the development of the Committee's programme.

Notes of Industry

The Morse Dry Dock & Repair Co. of Brooklyn, now has in commission the fifth section of its new 30,000 ton floating dry dock and is equipped to raise vessels of over 24,000 tons and 625 feet long. This month the sixth section will be in place, thus completing the largest dry dock of its kind in the world. Mr. E. P. Morse announces that the plant continues under the same management and has not been sold to the Government as has been rumored. "The property is not for sale; neither do we propose to sell any of our present holdings or equipment. To the contrary we intend to continue our policy of expansion with the object of giving to the port of New York, ship repairing facilities second to none in the world," he states.

William Beardmore & Company, Dalmuir-on-the-Clyde, has received a contract from the Australian Government for two cargo steamers of 22,500 tons each. The vessels will be 530 feet between perpendiculars, 68-foot beam and 43 feet 6 inches molded depth. Three vessels of a similar size are to be built by Vickers, Ltd., Barrow-in-Furness. Report has also been received that six 12,000-ton vessels will be built in Australia for the Government.

The Van Wie Pump Company of Syracuse, N. Y., successors to the Baldwinsville Centrifugal Pump Works, established in 1860, has withdrawn from the field and sold its entire business, drawings, patterns, good will, etc., to the East Iron & Machine Co., Lima, Ohio. The East company will continue to make the Van Wie centrifugal and triplex pumps and will also make repairs and repair parts, it is stated.

Announcement has been made by the Calumet and Hecla, Osceola consolidated Ahmeek Copper Company, Allouez Mining Company, La Salle Company, Lake Milling, Smelting and Refining Company, Superior Copper Company, Isle Royale Consolidated, and the White Pine Copper Company, employing 11,000 men, that every employe has been granted a free life insurance policy, in sums ranging from $1,000 to $1,500, payable to any named beneficiary, dated Oct. 1, 1919, without medical examination and without cost to himself.

One American company alone, during 1918, built, according to *Power,* over 500 synchronous motors, aggregating 300,000 h.p. capacity. Of this number over 200 motors, with an aggregate capacity of 90,000 h.p., were built for air-compressor drive alone. More than 86% of this horse power was for the driving of Ingersoll-Rand Class "PRE" compressors. When it is considered that this represents the output of one company only, and that there are a half-dozen or more large companies building this type of machine, it will at once become apparent what an important factor the synchronous motor is becoming.

Dealers in, as well as original sellers of, iron and steel scrap from explosive plants are warned by the Bureau of Explosives, New York, in a special bulletin, to guard against explosions caused by guncotton, picric acid, or TNT inside of pipes or receptacles. The following are instances of such accidents: Damage to a metal plant in the melting down of lead pipe containing picric acid, explosion in a storage yard because of contact of a lighted match with nitrocellulose, the severing of a hand from an explosion resulting from the crushing of pipe between two hammers, killing of employees cutting up pipe from the oil fields of Oklahoma, in which a detonating cartridge had been left. One explosive company makes a double inspection of all pipe leaving its plants; it is first burned in a woodpile and then inspected, each piece being marked with red paint; after it is loaded on cars another inspection is made, markings with blue paint indicating it.

At last the corn crop has to come to its own. The cob has been relegated to the scrap heap for a great many years as a worthless appendage after it had served its primal purpose. It is true that pipes of peace have been made out of it, but now comes the Department of Agriculture and is ready to utilize it, for it has been found that 35 per cent. of it is transformable into crystalline glucose which has many uses, one of them being the production of alcohol. Another use is adhesive which is used in making fibre boards and paper boxes. This adhesive could be made colorless and would replace the starch, dextrine, flour paste and only 3 per cent. of the cobs would have to be used to replace all this.

The American Ship Building Company, Cleveland, it is understood, has received orders for two large ore carriers and ten vessels of the Welland Canal size, which will be used in the Atlantic service.

The Sun Shipbuilding Company, Chester, Pa., has closed a contract for two tankers. C. E. Hendrixson is the purchasing agent of the company.

The Union Construction Company, Oakland, Cal., has been awarded a contract by the Standard Oil Company of California, to build a 2,800-ton oil tanker equipped with Diesel engines. The contract for the engines is held by the Skandia Pacific Oil Engine Company, Oakland, Cal.

The Stow Manufacturing Co., portable tool manufacturers of Binghampton, N. Y., have issued two new bulletins, Nos. 103 and 104, describing and illustrating their line. These are the first bulletins the company has issued since before the war.

A steam-driven turbo-blower has been sold by the Rateau Battu Smoot Engineering Corporation, New York, to the Famatina Mining Corporation, Argentine Republic. The blower is to deliver 7,000 cu. ft. of air at 14 lb. pressure. The speed of the unit is 22,000 r.p.m. The turbine operates at 150 lb. of steam pressure and a vacuum of 28 in.

Attention is called to the new annual United States Official Postal Guide which contains full postal information including a list of all post offices in the United States. The Guide is of special value to those who use the postal service extensively, particularly in the shipment of parcel post matter. The subscription price is 65 cents with 35 cents additional if the 11 monthly supplements published during the year are desired. Subscription blanks may be obtained at the General Post Office or any carrier station.

A new record for fast runs with a heavy train was made recently by eastbound express train No. 4 of the New York Central, Western Lines, on Sunday, May 14. This train covered the distance from Elkhart, Ind., to Toledo, Ohio, 133.01 miles, in one hour, 54 minutes, or at the rate of 70 miles an hour. The distance from Millersburg, Ind., 18 miles east of Elkhart, to Nasby Tower, about four miles west of Toledo, a distance of 111.31 miles, was traversed in one hour, 27 minutes, equal to 76.76 miles an hour. The train consisted of seven steel cars, weighing about 940,900 lbs. and engine, No. 4853, weighing about 250 tons with its tender.

The War Department, through its sales organization, is preparing to sell in the condition in which it was prepared for military use, approximately 17,000,000 yards of cartridge cloth which can be processed and offered to the American public as a silk fabric suitable for dress goods, suitings, tapestries and other uses requiring a silk texture of heavy warp. The cartridge cloth thus offered is a gray, gummy material resembling burlap, but a simple process effects a wonderful transformation and the material comes out a smooth fabric of the color and texture of pongee or silk Palm Beach cloth, which will dye fast and print plainly.

There is a motor vehicle registered in the United States for every twenty-four persons; in Canada the proportion is probably one to each fifty; in England, one to two hundred; in Denmark, one to three hundred; and in France, Belgium, Holland, Switzerland, and Germany, about one to every four hundred. In 1917 it was estimated that Italy had one car to each 1,000 of the population; Portugal, to each 1,690; Spain, to each 1,900; Austria-Hungary, to each 2,650; and Russia, to each 5,000. In Australia there was one car for each 140 of the population, and in South America as a whole, one for each 1,430. Many a minor city in the United States has more cars than the whole of China or Japan.

A gypsum process of dry scouring wool is said to have been discovered in boys' play; that while the developer's sons were playing on the sands of the Almagorda Desert, their greasy clothes were cleaned as if my magic. On investigation and experiment it was developed that gypsum of a high degree of dehydration absorbs the moisture present in wool, chemically breaks down the fatty and heavier materials adhering to the fibres and removes them along with the moisture.

Excavation work in the north tube of the 14th St. rapid-transit tunnel under the East River, New York City, was completed Aug. 7, when the last piece of rock between the tunnel headings between Brooklyn and Manhattan was shot away. The river section of the tunnel is 3,437 ft. between shafts. The top of the tunnel is 97 ft. below mean high water at the lowest point, while the bottom is 115 ft. The maximum pressure used in driving the tunnel was 39 lb.

One of the curious suggestions made in the Southwest for the saving of wheat at harvest is the use of vacuum cleaners of special size and construction. The idea is that machines of the proper construction could be run over the fields and gather up the loose heads of wheat where grasshoppers have eaten the stalks. In some cases 50 per cent. of the heads were lying on the ground as the result of this insect activity. Some farmers used close toothed rakes with more or less success. Others mowed the wheat and raked it up. It is possible the "vacuum harvester" is on the way.

Personal Intelligence

James H. Manning has been appointed assistant engineering manager for Stone & Webster. He joined the staff of Stone & Webster in 1910, and served as superintendent of construction on the Franklin, Verdi and White Salmon hydroelectric developments, besides preparing various engineering reports. He was later made head of the hydraulic division. In 1917 he became chief engineer of the American International Shipbuilding Corporation. Early in 1919 Mr. Manning was made consulting hydraulic engineer for Stone & Webster, and recently was appointed assistant engineering manager.

* * * *

W. Cromwell Gurney, president and general manager Gurney Foundry Co., Toronto, Ont., was overcome by an attack of heart trouble on Sept. 17 and died within a few minutes. He was the eldest son of the late Edward Gurney, founder of the Gurney Foundry Co. Last spring he suffered a severe attack of la grippe, which affected his heart, and he had not been in good health since. Mr. Gurney, who was in his 46th year, was born and educated in Toronto, and had been connected with the Gurney Foundry since he entered upon commercial activities.

* * * *

In recognition of services rendered to the Bound Brook Oil-less Bearing Co., Bound Brook, N. J., Harry J. Lindsley who has been Western sales manager for the past seven years, and William F. Jennings, who has been Eastern sales manager for the past five years, have been made vice-presidents of their company.

* * * *

Homer S. Morrison, formerly assistant superintendent of the steel plant of the Sharon Steel Hoop Co. at Lowellville, Ohio, has been appointed superintendent of the blooming and bar mills, succeeding William Parry, resigned.

* * * *

G. P. Goodman, who for several years has represented the Hisey-Wolf Machine Co. in the East, will join F. H. Niles & Co., Inc., on Oct. 1 to take charge of the portable tool department. F. H. Niles & Co. handles not only the Hisey-Wolf line of electric machine tools but the Canton pneumatic hammers and drills manufactured by the Pittsburgh Pneumatic Co. in the East. F. H. Crawford has been appointed secretary and J. E. Haetten sales manager.

* * * *

Cedric B. Smith has been appointed editor of *The Monad,* the official organ of the American Association of Engineers. Mr. Smith is a graduate in both arts and civil engineering from the University of Minnesota. His engineering experience has been with the Oregon Trunk Ry., the Great Northern Ry., the Chicago Great Western R. R., and the Pennsylvania Lines West of Pittsburgh. During the war he served as an officer with the 74th Artillery in the American Expeditionary Forces in France.

* * * *

John Kopf, formerly with the Bureau of Aircraft Production, Dayton, Ohio, has been appointed manager of the engineering department of the Duff Mfg. Co., N. S., Pittsburgh, manufacturer of lifting jacks and other specialties.

* * * *

L. G. Chase, formerly efficiency engineer of the Rosemary Manufacturing Co., Rosemary, N. C., has been appointed mechanical engineer of the Yarnall-Waring Company, Philadelphia.

* * * *

On October 1 the Birmingham (Ala.) office of the Chicago Pneumatic Tool Co. was moved to No. 1925 Fifth Avenue, North, that city. The company will maintain hereafter at that address a service station where will be carried a stock of their products.

* * * *

E. G. Buckwell, secretary and manager of sales of the Cleveland Twist Drill Co., Cleveland, has just returned from a three months' visit to England and the Continent where he has made a thorough trade investigation in conjunction with the European branch, the Cleveland Twist Drill Co. of Great Britain, Ltd., London.

* * * *

The Chicago Pneumatic Tool Company announces the appointment of Fred Gehbauer, as special Navy Yard representative with headquarters at their Philadelphia office, 1740 Market street.

* * * *

Harry Hodgman, for the last six years connected with Missouri River improvements as United States Assistant Engineer, with offices at Jefferson City, Mo., has been transferred to the Detroit River district. He will have charge, under the direction of Col. E. M. Markham, Corps of Engineers, U. S. A., of the widening of the Livingstone channel.

* * * *

Melville J. Collins has been named general superintendent of the Mahoming Valley Steel Co. at Niles, Ohio, succeeding William Lynch, resigned. Mr. Collins has been with the company since it was formed and was formerly in the operating department of the Empire mills at Niles of the Brier Hill Steel Co.

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W. L. SAUNDERS, *Editor*

FRANK RICHARDS, *Technical Editor* FRANCIS JUDSON TIETSORT, *Managing Editor.*

CHARLES A. HIRSCHBERG, *Business Manager.*

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EFFICIENCY SOMETIMES HITS THE SUFFICIENCY MARK

MAN EFFICIENCY.

"Efficiency, like an invention, always comes to an individual, never to a committee, or to an organization, and the weakness of co-operative production is the undervaluation of the individual, the manager who develops efficiency in other men. In most spheres of action, and in the economic world in particular, some men are much more efficient than others. Such men possess more ability than the majority of their fellows and among this higher class there are varying degrees of efficiency. Modern industry has been developed through the invention of efficient machinery. Man efficiency, however, is today of far greater importance than the further development of efficiency in machinery, and the greatest problem before us today is not the further improvement of machinery, but the development of an increased efficiency in men."
—JAMES LOGAN.

ISN'T EFFICIENCY simply *wonderful?* Every eventide before donning the Marquisian night garment, one asks himself, "Have I been efficient today, or have I *failed?*" Hermione, protege of MR. DON MARQUIS, may wind up a perfect day like that, after she and her "little group of serious thinkers" have taken up and disposed of efficiency.

Manufacturers, producing business men, fail to set themselves right on the subject so easily, and yet the correspondence schools and "institutes" and organizers and system experts and personnel pickers and commercial counsel are abroad in the land like a Mosaic cloud of locusts.

The older fashioned, more conservative business men, who pride themselves on being practical, become disturbed of countenance and usually listen with impatience when some young enthusiast begins to dilate on the subject of efficiency. The newer order of specially trained business man, who gets his foundation in a university course, revels, on the other hand in the subject of real or fancied efficiency until on occasion his views become of a sufficiency.

Somewhere between these two extremes there is no doubt to be had real efficiency that can be applied alike to business, professional and personal routine—without taking all the joy out of life and work. Efficiency as administered by its most efficient exponents, is not so hard to take if one does not attempt to swallow it all at one dose. It is a disciplinary and educational diversion that grows on one and is rather fun than a bore if one starts in on the courses of instruction before forty years have claimed him. Every year after that it seems to become more and more of a castor ile proposition.

One brief lesson a week is about all anybody can stand in efficiency, be he young or old. It is true, too true, what HARRINGTON EMERSON says, that "the hardest task of the man who, through study, research and experiment, finds new and

better ways of doing things, is not to make his discoveries, but to get those who need them most to adopt and make use of them."

Mr. EMERSON has frequently found it necessary to plead the cause of the efficiency expert and in so doing he has stated some truths. For instance:

"'Practical' advertising men ridicule the theories of those who have studied the physchological and optical principles, and the economic factors involved in advertising. Yet by the use of these very theories the greatest advertising successes of today are won."

He tells the story of a Chicago printer who was doing an annual business of $100,000, on which his profits were only $4,000. It was too little—he had to work too hard and too long to earn it. So he called in a cost specialist. As a result he did only a $50,000 business the next year, but his profits were $12,000, and his work was easier, with night overtime and worry eliminated. One can see where the customers probably paid for this particular efficiency somewhere along the route, but it surely must have filled a long felt want for the printer.

If one will let the efficiency chap talk long enough, even though one be determinedly "sot in his ways," his capitulation is certain. The popular magazines are full of efficiency fiction to prove it. Of course, as a last resort, one can always hire somebody to be efficient for him!

None need advice from others more than those unwilling to accept it just because they already know a little about the subject in hand. A *little* knowledge is indeed a dangerous thing. Mistaken sufficiency is not efficiency. We must step on our gas and become really efficient.

BURIED TREASURE SOUGHT BY ENGINEERING EDITORS

EDITORS of all engineering and technical publications are extremely likely to find themselves in accord with the editor of *Municipal and County Engineering*, who finds that much valuable data and information which never sees the light of day lies tucked away in drawers and cabinets, much of it forgotten. He observes that the engineering editor's idea of buried treasure may provoke a smile, but, understand, the editor has a right to his opinion, and, fortunately, he has the opportunity to express it. Since the editor deals in engineering literature it is only natural that his idea of the treasures of earth should pertain to the great unworked deposits of raw material of this sort which are known to exist, but which remain deeply buried in the engineer's brain or in his files. It is a very tantalizing thing to know that these gems lie at the dark, unfathomed bottoms of filing cabinets in all parts of the country and that all the persuasive powers of the editor are not sufficient to draw them out for useful purposes. What a melancholy thing it is to realize that many flowers of engineering eloquence or expression are but "born to blush unseen!"

Every month the editor goes prospecting around for these treasures. By keeping his sleeves well up at the elbow he manages to uncover a good deal of this material which assays sufficiently high to make its recovery well worth the effort involved. But always there remains regret that those who inter these treasures are so slow to exhume them.

PINS AND FORTUNES

E. H. HARRIMAN, the railroad wizard, died leaving behind him an estate valued at approximately $75,000,000, but he knew the value of trifles. One day he picked up a small steel letter clip dropped on the floor by a careless employee.

"I'd like to have as my annual income," said Mr. HARRIMAN, "the value of material thrown away every year by indifferent workers in the offices and factories of America. In a few years I'd be the richest man in the world."

Nor was Mr. HARRIMAN given to business exaggeration. His quick observation inevitably made him cognizant of universal waste in the indicated direction; his keen sense of financial values rated it closely. And the truth enunciated by the railroad financier and magnate by the ordinary man or woman of business may be attested at every turn of the eye.

A Chicago business man not long ago cast about in his mind for ways and means of saving

money for a special and specially desired avenue of business increase. An experienced adviser suggested looking after the "small leaks." The business man, recognizing the wisdom of such suggestion, looked over his plant quietly but sharply. He was shocked at the continual waste going on all about him. Sheets of paper on which only a few words had been written thrown into the waste basket instead of being used for making notes or similar "scratch pad" purpose. Pins, clips, rubber bands, blotters, erasers dropped on the floor and never recovered. Ink and mucilage bottles, carelessly set down, tipped over. Typewriters left uncovered, undusted, with unwarranted repair bills in consequence. Electric lights left burning when not in use.

The employer meditated, took action, made an interesting announcement. The office boy turning in to him the greatest number of salvaged articles in good condition at the end of the week would receive a Thrift Stamp for every 50. The boy with the largest month's salvage record would find a War Savings Stamp in his pay envelope. The offer would be repeated from month to month.

The offer didn't amount to much after the first few weeks because it impressed such a good lesson. At the end of the first month, despite the extra care of the wondering clerical employees, the employer's exhibit served as text of a terse little sermon that set all the office force thinking—and saving.

One should not be ashamed to practice care in small matters. Waste of any sort is criminal. Being careful means being successful. It may save or start a fortune in the long run when you stoop to pick up that stray pin.

SCHOOP PERFECTING HIS METAL SPRAY PISTOL

WITH FURTHER reference to our editorial in the June, 1919, edition respecting the use of the metal spraying or plating pistol in Germany during the war for the conservation of copper, nickel and other metals scarce at the time, which commentary attracted wide attention in this country and in England, we observe that M. Schoop of Switzerland, inventor of the method of metal spraying by air, has issued a statement made public in the English press.

Mr. Schoop states that he is now engaged in working out further details of his new electrical spraying process, by means of which molten metal is applied with an electric spraying pistol. The promising results so far obtained, and the apparatus already constructed, lead him to anticipate that in the near future it will be possible to supply single electric spraying pistols, which may be connected on to any electric circuit.

In the new type of apparatus the metal is smelted by electricity (40 amperes at 30 volts) and not by compound gases, and the method of procedure is so different from the old one that a remarkable improvement of the method may be expected.

HOW TWO BROTHERS SAVED THE DAY FOR ITALY

A TYPE of the foreign delegates selected by England, France, Italy and Belgium to meet business men of America at the International Trade Conference in Atlantic City late in October, is to be found in Frank A. Vanderlip's new book, "What Happened in Europe"—Pio Perrone of the great Ansaldo Company, at Genoa. Mr. Vanderlip says:

"When the father of the Perrone Brothers died, the two sons, with a touch of Italian romanticism, stood at the bier and made a stern compact one with the other that they would never admit German capital into their great industrial inheritance. At the outbreak of the war it and various subsidiaries had become stock companies, the whole group being generally known as the Ansaldo Company, and it had great and varied industrial capacity, running through shipbuilding, the making of turbines, the construction of locomotives and the building of electrical machinery.

"With Italy's entrance into the war these two men had the imagination to realize that the Great War was a war of industrial capacity. They offered at once to turn their establishment into the making of large guns for the army. They got no orders for guns. Lack of orders, however, did not daunt them. They secured from Italy's Allies the designs of the most efficient French guns and without a single order from the Government, and in the very first days of the war, they started to convert their plant into an ordnance establishment. Before they had reached an order for a single gun they had completed 2,000 pieces of ordnance.

"Then came the Caperetto disaster. And not until that awful defeat did the Italian Government turn to them with cries for guns. When the first order was placed, the officials were confounded on being told that the guns were ready

for immediate delivery. These two thousand guns were at once put in the field to take the place of the vast losses which the Italian army had sustained, and furnished Italy a service in stopping the advance of the Austrians the value of which can hardly be measured. The Ansaldo Company could now get orders, but they could not get pay. The orders were unceasing. The pay continued elusive. The great works, however, were operated to their utmost capacity, and performed a feat at which those in America who know by experience the difficulties of ordnance production will marvel. Works that employed one hundred thousand men were created and ten thousand guns were put in the field. At one time the Italian Government owed the Ansaldo organization 700,000,000 lire.

"In a struggle balanced to such a nicety as was the Great War; when Paris was saved and perhaps the whole cause saved by the opportune arrival of a handful of Americans at Chateau-Thierry, it can be justly said of each of many factors that the war could not have been won without this or that particular contribution. In that sense it seems to me it can truly be said that without the contribution of the Perroni Brothers, and of their industrial organization of a hundred thousand men they brought together in the Ansaldo works, the Great War could not have been won. For Italy's cause would have been lost, and with that loss might have come the downfall of the great cause."

U. S. TO HAVE MERCHANT FLEET OF 25,000,000 DWT. TONS

ANNOUNCEMENT was made by the United States Shipping Board in the middle of September concerning the actual tonnage of the United States in merchant marine service. While the building activities of the Emergency Fleet Corporation have been largely curtailed since the signing of the armistice a year ago, this country has made a formidable showing in the world shipping lists and in shipbuilding. We are again serious contenders in deep sea commerce carried in our own bottoms. The completion of the government construction contracts which were not cancelled, and the building for private account which will follow at many of the big yards, will further improve our position in the next few years.

The Shipping Board had completed construction, up to August 29, 1919, of 6,420,701 deadweight tons of steel, wood and composite ships; seized from Germany and Austria 607,502 tons; purchased from Japan and Australia 158,326 tons and requisitioned from private owners 519,870 tons, a total of 1,280 ships of 7,706,240 deadweight tonnage. These figures do not include 122 steel ships of 465,745 deadweight tons and 63 wooden ships of 246,982 deadweight tons sold recently to private owners, mostly foreign, nor does it take in seized vessels that had been sunk.

Mr. Walter Scott Meriwether, Manager of the Information Bureau of the Shipping Board, for many years widely known as "Skipper" Meriwether, ship news writer for New York dailies, states in his comprehensive report that America's rapid advance from an inconsequential place among the maritime nations to the post of leadership in shipbuilding, was not only phenomenal but is a fair augury for the permanence of its new merchant marine, built under the stress of war.

At the outbreak of the world struggle, merchant marine construction had almost become a lost art in this country. Today this nation has more shipworkers, more shipyards, more shipways, more vessels under construction, and is turning them out more rapidly and in greater numbers than now issue from all the shipyards of all the rest of the world combined.

As the premier shipbuilding nation of the world America attained her place in one giant stride. Up to the outbreak of the war we had only 15 vessels of 1,000 tons and over engaged in oversea trade. Today the American flag floats from 1,280 ocean going steamships, 1107 of which had been built by the United States Shipping Board within the last two years.

In June, 1914, the total gross tonnage under the American flag, including coastwise shipping and the fleet operating on the Great Lakes, was 4,287,000 tons. In June, 1919, its gross tonnage was 11,983,000, an inrcease of 278 per cent., chiefly in ocean going steamships.

The steam tonnage under the American flag is now 24.8 per cent. of the steam tonnage of the world. The world steam tonnage of 100 gross tons and over on June 30, 1919, as reported by Lloyds, was 24,386 vessels of 71,845,500 dwt. tonnage. American steam tonnage of 100 gross tons and over on June 30, 1919, including tonnage on Great Lakes, was 3,687 vessels of 17,974,500 dwt. tonnage.

The per cent. of world steam tonnage of 100 tons and over under the United States flag on June 30, 1919, was 15.1 and the per cent. of tonnage was 24.8. These percentage figures include tonnage on the Great Lakes.

In the four years preceding the war, the shipyards of this country turned out a total of 107 seagoing vessels of 1,500 tons and over, chiefly

coastwise. This construction represented 805,037 deadweight tons.

During 1918, a period when the Shipping Board was getting into its stride, there were launched from the yards under its control a total of 4,216,656 deadweight tons, five times more than had been built in the four pre-war years. During the year 1918, shipyards under control of the Shipping Board, delivered 3,107,093 deadweight tons of completed ships.

From January 1, 1919, to August 29, 1919, 3,983,135 deadweight tons of shipping were launched, and 3,845,140 deadweight tons delivered; a total for the twenty months (since the beginning of 1918) of 8,199,791 tons launched and 6,952,233 delivered.

The original construction program contemplated the building in this country of 17,807,071 deadweight tons of shipping; 2,105 steel steamships of 14,351,971 deadweight tons, 1017 wood steamships of 2,978,100 deadweight tons, 50 composite ships of 175,000 deadweight tons and 43 concrete ships of 302,000 deadweight tons, a total of 3,215 ships.

Steamships to the number of 408 and aggregating 1,920,724 in tonnage are being fitted out in wet basins at this writing. On the ways are 389 steel steamships of 3,015,605 dwt. tons; 99 wooden steamships of 207,000 dwt. tons; 9 concrete steamships of 63,500 dwt. tons. Then in addition to these already under construction there are still to come 227 steel steamships of 1,476,610 dwt. tons which have been contracted for, but upon which work has not yet been begun.

Including completion of vessels launched, but not delivered, completion of vessels for which keels have been laid and completion of vessels under contract, there is still to be delivered a total of 6,683,439 dwt. tonnage in ships. When this fleet is added to our existing steam tonnage, including that of the Great Lakes, America will be in possession of a great fleet aggregating nearly 25,000,000 deadweight tons.

It is interesting to note that the seagoing personnel under the control of the United States Shipping Board now numbers some 51,560 men, of which 4,592 are deck officers and 4,592 engineer officers.

EMINENT ARMY ENGINEER JOINS U. S. SHIPPING BOARD

The United States Shipping Board has announced the appointment of Colonel E. H. Abadie as Comptroller of the Division of Operations, in place of John J. Nevin, resigned. Colonel Abadie joined the United States Army June, 1917, as a Major of Engineers and subsequently entered the Construction Division as Supervising Constructor. As such he had personal supervision of Camps Funston, Dodge and Lee and entire direction of construction and administration of the Augusta (Ga.) Arsenal Depot, the mechanical repairs shops at Camps Normoyle, Texas, and Holabird, Md., also of the General Army Hospitals at Biltmore, Azalia, Waynesville, Hot Springs and Denver, the War Prison Barracks at Atlanta and Fort McPherson and the Quartermaster's Depot at Atlanta. He was promoted to Lieutenant-Colonel, Quartermaster's Corps, Construction Division, in August, 1918.

Prior to his entrance into the army, he had been engaged in engineering work chiefly for municipalities, public service commissions, large neering societies, the Society of the Colonial Wars, the Military Order of Foreign Wars and of the important clubs of St. Louis, his home city. He was also Secretary and Treasurer of the Industrial Engineers' Corporation of that city.

Another change announced by the Shipping Board was the appointment of Alonzo Tweedale as Treasurer of the United States Shipping Board Emergency Fleet Corporation, vice Waldo S. Reed, resigned.

AIR MACHINERY EXPORTS

The Bureau of Foreign and Domestic Commerce of the Department of Commerce has provided to us for publication the following table of exports from the United States of air compressing machinery, by countries, for July, 1919:

Countries	*Dollars*
Belgium	912
Denmark	1,840
France	34,833
Italy	6
Norway	211
Spain	8,165
Sweden	923
England	41,129
Canada	19,602
Mexico	7,004
Cuba	6,741
Haiti	346
Argentina	840
Bolivia	5,135
Brazil	15,276
Chile	2,597
Colombia	40
Peru	7,201
Uruguay	18,007
China	6,404
Dutch East Indies	11,599
Japan	370
Siam	100
Australia	208
Philippine Islands	5,255
British South Africa	2,044
Total	196,789

A new use has been discovered for gas masks. Word comes from Indiana that these masks are in demand for threshing and shipping wheat infected with Australian take-all. All grain is so saturated with formaldehyde that the workers cannot stand the fumes.

DEATH OF A GREAT TUNNEL ENGINEER

Charles Mathias Jacobs, whose specialty was subaqueous tunnel construction, and to whom New York City was indebted as to no other man, excepting Alfred Noble, for the successful solution of its phenomenally difficult tunnel problems and the establishment of tunnel building upon a secure basis, died in London on Sept. 7, in his 70th year. It will be remembered that Alfred Noble also died at the age of 70, five years ago.

Jacobs was born at Hull, Yorkshire, and was liberally educated. After leaving Cambridge he acquired a practical knowledge of his profession in the shops of Charles and William Earle, engineers and shipbuilders of his native city. He seems to have adopted his specialty—or perhaps his specialty had adopted him—from the beginning. He became an independent engineer and before the age of 40 he had a wide reputation as an expert in subaqueous and marine engineering. He came to this country in 1889 to become the general advisor of Austin Corbin, then President of the Long Island Railroad, for the carrying out of various plans for the development of New York's rapid transit schemes, which arangement collapsed with the death of Mr. Corbin.

The first of all the river tunnels of New York was that of the East River Gas Company, for carrying large gas pipes from Ravenswood, L. I., to Seventy-first Street, Manhattan. This was started in solid rock from both ends and was expected to be of the same character for the entire distance. A depression of the rock surface under the channel left only soft river debris to be penetrated and under the original contractors the work came to a standstill after several fatalities. Mr. Jacobs drove the work to completion, in its progress solving novel and most difficult problems, developing the modern methods of tunneling under pneumatic pressure and placing the trade of the sandhog upon a basis of safety.

The so-called McAdoo tunnels under the North River had been an abandoned enterprise for several years after a catastrophe which cost many lives and left the work hopelessly flooded. Work here was taken up again and carried to complete success under the direction of Mr. Jacobs.

The building of the first twin tunnels for the Pennsylvania Railroad was a still more exacting undertaking which the previous experiences had led up to, in the developing of the system of working and the providing of most necessary devices both for safety and for celerity and economy of operation.

In connection with the planning and construction of these tunnels one most serious problem was ingeniously solved in anticipation of serious trouble to be experienced, but the application of it proved to be uncalled for and a considerable additional expense was saved. Although the McAdoo tunnels had proved sufficiently stable in service, it was feared that with the heavy trains traversing the Pennsylvania tunnels there would be sinkings or fluctuations up and down of the tubes in the soft and yielding semi-fluid material surrounding them, and accordingly as the tunneling progressed and the cast-iron lining was placed large holes were provided at frequent intervals in the bottom of the tube for the insertion of screw-piles made in sections and of considerable length which would serve as anchors and assure the required vertical stability. The screw-piles eventually were not required, but the record of the device attests the ready resource of this great tunnel engineer.

Since the completion of the tunnels above mentioned, with the difficulties they solved and the methods and resources they developed the building of subaqueous tunnels at New York or elsewhere has become merely an affair of time and money with the insuperable difficulties forgotten.

Mr. Jacobs had been the senior member of the firm of Jacobs & Davies from which he had retired. A later engagement was under the French Government for constructing a tunnel under the Seine on a line connecting Havre and Rouen. He was a member of many engineering societies both of this country and England, of the Engineers' and Railroad Clubs of New York and London and of the Royal Societies and Automobile Clubs of London.

Speaking on Progress of Aviation in the War Period before the Royal Aeronautical Society recently, Dr. Leonard Bairstow said that the speed of aeroplanes had increased from 85 miles per hour to 135 miles per hour in five years, and some further improvement might be expected in the future. No equal addition to the speed range was probable, and economy suggested a reduction. It was not possible to decide from a single estimate of the value of speed in civil aviation, but for fighting it was the last reserve of superiority, which was all important.

The Chester Shipbuilding Company, Ltd., Chester, Pa., a subsidiary of the Merchant Shipbuilding Corporation, Harriman, Pa., has been closing a contract for two large tankers. Details regarding these vessels have not been announced at this writing.

Buenos Aires

A SCENTSASHUNAL COON HUNT

By the Hive Farm Boys, Monroe, N. Y.

Done into unfamiliar Latin Satire

By HENRY WELLINGTON WACK

'Twas a nox most opportunum
For moon hunting brindle coonum
With old canis, all a frettum
With his pesky fleas from Ghettom.
Scratched he then no more his belly;
But with eye alight with hell, he
Animabit fierce with growling,
Started coonward—sniffing, prowling,
As with aqua fortis gaited
And by coon-scent animated!

Luna lit her Lux on Mundus
With a Lux quid est profundis.
Pater, mater, all somnolens
In farm domo, snorem volens,
Heard no sonam noctis Bratti,
Nor of caterwauling catti.
Nox was quiet and right boonum
When we tres venit for coonum.

Verdant field near pomme de terrier
Locum est for creatures merrier
In the noctem than the morning—
Creatures Sol lux always scorning.
There our bonus bravus canis
Spied a hole in wild terrainis,
When his muzzle said, with worry,
"Now for bellum in a hurry!"
So with tail-piece all erectum—
We and canis hold inspectum.

Salutated we with clubsticks
And with divers farm-boy mean tricks,
Coon hole there upon the hillside,
Where old canis—nose all inside—
Cussed young coonum to come hither;
And cute coonum, coming hither,
Handed canis feline bellum,
Sprayed him then with scent like hellum—
Avec Polecatine de Rose—
Gas that partibust Brat's nose!

Bratti, Canis,
Skunkus fugit.

Hic now finis coonum fandi,
Hic we longed for poni brandi
To revive young Bratti's senses,
Lost to skunkus false pretenses.
Oh such tang, skunked Bratti scattered
And the swats old pater battered
On the pants of smelly Bratti,
Yowling now like hellish catti.
Nevermore, with tails erectum,
Will we tres-strange holes inspectum!

MORAL

The world hath many holes, you see,
That are not what they seem to be!

A diurnal colyumnist declares that if the human race hadn't got kicked out of the Garden of Eden it would never have had the sense to invent machinery, but we don't see what this has to do with the price of wheat. Possibly he means that every boost is a help.

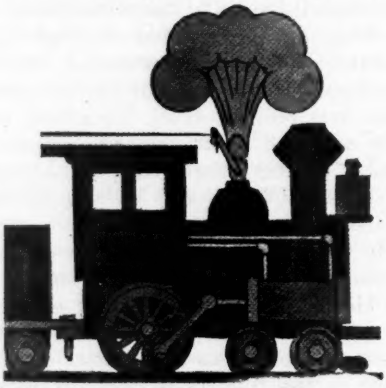
A REAL SPEED DEMON

It is his indomitable sense of humor that has kept him up. He has the worst fracture in the ward. But he knows cars from Alfalfa to Omaha, as O. Henry would observe. Gasoline is his middle name. When they put a frame over the foot of his bed to keep the covers from touching his leg the white sheets formed a hood unmistakably, and it was a long, low racing car—white with gold trimmings—"the kind ya drive sittin' on the back o' ya neck," he explained. He was challenging De Palma at Indianapolis. Humoring him, the Red Cross man brought him a klaxon, whose stentorian presence caused more than one nurse that passed his bed to stop suddenly and, clutching her medicine bottles, look quickly about her with scared eyes, to the huge amusement of the ward.

"Little girls like you oughtn't to cross the street all by y'r lonely, where nasty automobiles can run over ya!" he teased.

The make believe chariot varies with his humor. Sometimes it is a Ford bouncing over tortuous roads, or it's a Rolls-Royce, absolutely!

Ward No. 7 will be dull when he goes, even if the klaxon does bring down anathemas upon his head.



A SATURDAY EVENING POST LOCOMOTIVE—FOR DECORATIVE PURPOSES ONLY. EVEN COMPRESSED AIR COULDN'T MAKE IT WORK.

THE PROFITEERS

Twain butchers kin,
  Styled Bone & Skin,
Would starve poor folk, or near it;
  But be it known
To Skin & Bone
  That flesh and blood won't bear it.

The Profiteered.

PHILOSOPHY AND FOOLISHNESS

An optimist is one who can slip on a banana peel and repeat the Lord's Prayer.

Some men are born with black eyes and others have to put up a scrap to get them.

The fellow we know who never makes good on his word has as his motto, "It's a stingy guy that won't promise you something."

Sign in a millinery shop: "WANTED—Milliners to trim rough sailors."

The chap who gives away his friends usually hasn't any to spare.

Do you ever spend anything but the evening?

SKIMMED MILK

I cannot sing the old songs,
  I'm very weak on rhyme,
The sturdy, manly, bold songs,
  I have no sense of time.
And so I write vers libres,
  Where latitude's immense,
And sell them, too—indeed, I do—
  For sense.

I cannot make a sonnet
  However much I try,
Nor rhyme, my word upon it,
  An ode, though I should die.
So I indite vers libres,
  Dark, passionate, intense,
Nor do they fail to find a sale
  For cents.

W. W. WHITELOCK.

It is often proper to enquire the reasons for the *doing* of things; but nobody doesn't never need to tell nobody no reason for *not* doing nothing.

EXTRA! VICTORY! VICTORY!

The subjoined exact extract from an Italian wine dealer's circular, printed in Italian, and with this translation into "English," should not be withheld from distribution throughout an arid world. With utmost impartiality we have already send it along to a couple of newspaper colyum conductors in New York just to test their selfishness when in possession of such valuable information. Bunny has read it and he declares that, if you cut out the five words preceding "full of LIQUORS AND CORDIALS," you probably have the situation in a nutshell.

VICTORY

The strenght of intellect, the wonderful human brain—with which the man lives—thought, overthrow—destroy—discover and create—even this time as song VICTORY!! Yes, VICTORY! because, has an eagle dominating the highest mountains, flying on top of all the laws more or less logic, more or less incostitutional, as hallered with all his strenght, as the greatest warrior:

VICTORY! VICTORY! thou shall not pass!

So to day I sing victory, for I am opening a new rich store full of

LIQUORS AND CORDIALS

that no prohibition law can stop me sell in bottles or in cases.

These Liquors and Cordials are not alcholic, and they are assorted in different varieties. They are put up very elegantly. They can be used on any swell dinners, Weddings, or Christenings.

The prices are moderate, and I make reductions in case lots, of twelve bottles.

HOW TO BE A HAPPY REFORMER

For every evil under the sun
There is a remedy, or there's none;
If there is one, try and find it,
If there's not, then never mind it!

PREACHMENTS

Don't be afraid to act upon your good impulses. They are like muscles; if you don't put them to use, soon you will not have any.

* * * *

The gaining of applause should be left to actors and politicians; with other folk it is a weakness.

* * * *

Salary is frequently the small end of the compensation for the job; it is, if the person drawing it has the right stuff in him. And the more he takes his compensation in earning appreciation the more his salary will grow.

* * * *

The man that renders noble service to mankind is rich, even if he dies penniless. Future generations will erect his monument in marble or in books.

The Oracle.

TOO FAST FOR BROADWAY

He ran so long, and ran so fast,
No wonder he ran out at last;
He ran in debt—and then, to pay,
He beat 'em all, and ran away.

Shipyard Sam says: I was chinnin' with a politician who was down here to a launchin' last week, and says he to me, "What is the secret of the great success attained by the type of vessel you construct here?"

Said I, very bluntly: "Fabrication."

And he replied in a surprised manner, "What a coincidence! That is also the secret of my success!"

BAWMIE INTHEBEAN.

CONFIDENTIAL EMPLOYMENT BUREAU

NOTE—Advertisements under either of the classifications below will be numbered in the order of receipt and published free of charge, for the benefit of readers, in the next issue after date. All applications for the use of this convenience should be directed, "Confidential Employment Bureau," Compressed Air Magazine, Bowling Green Building, New York City. Replies to advertisements will be forwarded to the person or persons concerned.

POSITIONS WANTED

No. 861—Wanted position as mining captain by man of extensive experience in all methods of mining in flat and inclined seams. Can produce excellent reference as well as mining certificates as superintendent issued by the British Goverment.

No. 862—Position as draftman wanted by man with four years' experience in the Drafting Dept. of a large American shipbuilder. Can give best of references. At present employed but seeking opportunity holding greater prospects for the future.

No. 863—Superintendent of a large gray iron foundry will be available for connection on January 1. Familiar with modern methods and foundry practice. Full particulars requested in first letter.

No. 864—Superintendent of erection on structural work both bridge and building, seeking connection where there is an opportunity for investment in some good thriving erection company.

HELP WANTED

No. 433—Foreman required to take charge of detail room of a middle west manufacturer of high grade appliances. Give full particulars as to qualifications, reference, remuneration and present connection.

No. 434—Wanted by a New England textile mill—a superintendent especially familiar with modern textile machinery. A going plant requiring some modernization. Give full particulars in first letter.

No. 435—Foreman sought for repair department of a Pennsylvania coal mine. Must be familiar with repair work of all kinds, having had experience with above and below ground qeuipment. A knowledge of electricity desirable.

The Fuels Section of the Bureau of Mines is now engaged in an investigation of what actually happens in the combustion space of a powdered-coal-burning furnace, with particular reference to the ash disposal and furnace maintenance.

According to the United States Geological Survey, shaft 3 of the Tamarack mine, Houghton County, Michigan, is the deepest mine in the world, with a depth of 5,200 ft. Other shafts of the Tamarack and of the Calumet and Hecla mine in the Lake Superior region reach depths of between 4,000 and 5,000 ft. Three shafts of the Prizbram silver mines, Austria, have penetrated to depths of 3,300 ft. The Victoria quartz mine, at Bendigo, Australia, is 4,300 ft. deep, and a number of shafts in the Transvaal gold region have been sunk to depths of nearly 4,000 feet.

The U. S. Bureau of Mines has notified the National Coal Association that it will be unable to enforce the law governing regulation of explosives. Lack of funds is given as the reason.

Books and Writers

LUMBER MANUFACTURING ACCOUNTS, by Arthur F. Jones, Associate of the Institute of Chartered Accountants. Second printing. With tables and charts. Price $2, net. New York: The Ronald Press Company.

AS MR. JONES explains, this treatise on lumber accounting, applies primarily to what may be termed commercial lumber; such as is produced from the vast forest areas in the South, Middlewest and Northwest of the United States, and in Western Canada. Any system, he observes, devised for "hard" or "precious" woods, would be somewhat more elaborate; for, in proportion as the commodity dealt in becomes more valuable, it must be more carefully guarded. This applies, however, more particularly to statistical records as distinguished from accounting.

For years lumber accounting has been hampered by the fact that there is no uniformity of opinion among lumbermen or accountants with regard to certain essential features of the business, such as the treatment of interest and taxes on temporarily unproductive forest areas (now under discussion at Washington as potential food-producing land), the price at which a lumber inventory should be valued, and the definition of the true lumber cost. In his own volume the author puts forth methods that are at least debatable and ideas that he admits are opinionative, but he treated his subject in such a way that the adoption of a definite basis was necessary. The principle of "cost" has been maintained throughout, regardless of the author's own views. The use of technical terms is avoided as far as possible, and those that appear are either immediately explained or may be found in the glossary.

The book takes one back to a day when he was a lumber "accountant," twenty-eight years ago in the final heyday of Michigan lumbering, when he toiled from early morn to dewy eve on top of great lumber piles, deposited by lake schooners, in tallying millions of feet of pine. One still remembers with a little thrill how the boss commended the tallying of one shipload to within 500 feet on a million foot shipment and added a bonus of fifty cents to the weekly wage of $4.50. La, la! Times, methods and prices have changed. A dime would buy in lumber in those days what costs one of our shrunken dollars today.

DRAFTING, an "Opportunity Monograph" of Vocational Rehabilitation Series No. 29 prepared by the Federal Board for Vocational Education and issued in co-operation with the Surgeon General, War Department, and the Bureau of Medicine and Surgery, Navy Department. This is one of a series of works for the disabled soldiers, sailor, or marine, to aid him in choosing a vocation. It treats of mechanical drawing, mechanism and machine design, tinsmithing, sheet-metal drafting, architectural drafting, hydrographic and topographic drafting, ship drafting, patent drafting, commercial and other drafting and lettering. It is issued free and may be obtained by addressing H. L. Smith, Chief Rehabilitation Division, Federal Board for Vocational Education, Washington, D. C. Washington: Government Printing Office.

ELECTRIC WELDING, another Opportunity Monograph of Rehabilitation Series No. 40, issued under the same auspices as above. Washington: Government Printing Office.

READJUSTMENT AND RECONSTRUCTION ACTIVITIES IN FOREIGN COUNTRIES, being Vol. 1 of Readjustment and Reconstruction Information issued by the United States Council of National Defense, Herbert N. Shenton, Chief. Manufacturers and other business men engaged in foreign trade will find this pamphlet of decided value. The edition is restricted because of lack of funds. One copy has been sent to each Chamber of Commerce in the United States and two copies to libraries, the remaining distribution being to editors of technical journals. Business houses may avail themselves of the valuable data it contains at the places mentioned. Washington: Government Printing Office.

NEW MINING TREATISES

The Bureau of Mines of the Department of the Interior announces the following new publications (List 69) of interest to readers of this periodical:

BULLETINS

BULLETIN 165. Bibliography of petroleum and allied substances in 1916, by E. H. Burroughs. 1919. 159 pp.

BULLETIN 176. Recent developments in the absorption process for recovering gasoline from natural gas, by W. P. Dykema. 1919. 90 pp., 20 pls., 30 figs.

BULLETIN 178-A. War gas investigations of the Bureau of Mines, by Van. H. Manning. 1919. 39 pp.

TECHNICAL PAPERS

TECHNICAL PAPER 212. The determination of combustible matter in silicate and carbonate rocks, by A. C. Fieldner, W. A. Selvig, and G. B. Taylor. 1919. 22 pp., 1 fig.

TECHNICAL PAPER 216. Vitiation of garage air by automobile exhaust gases, by G. A. Burrell and A. W. Gauger. 1919. 12 pp. See review.

TECHNICAL PAPER 217. Saving coal in steam power plants, by U. S. Fuel Administration. 1919. 8 pp., 1 fig.

TECHNICAL PAPER 224. Metal-mine accidents in the United States during the calendar year 1917, by A. H. Fay. 1919. 80 pp.

The Norman W. Henley Publishing Company of New York has issued recently its new catalogue of practical and mechanical books for the benefit of engineers, superintendents, mechanics in general, and students. The catalogue will be sent to inquirers on receipt of request.

THE CARNEGIE PARADOX

By FRANK RICHARDS

I DO NOT see why it is not eminently proper, not to say considerably obligatory, for not only the newspapers of the day but also the specialized press, and particularly the publications devoted to engineering and industrial matters to give extensive space to the chronicling and consideration of a most notable event of even these epochal times, which the death of Andrew Carnegie must certainly be considered; and so I take the liberty of submitting a few of my personal cogitations as a small contribution to the general outspeaking which the occasion calls for.

While, as I here suggest, and as all must concede, the death of Andrew Carnegie is an event which makes the broadest and strongest appeal to all civilized humanity, it is a singular fact that no one has habitually thought of him, no one thinks of him even now as first of all, if at all, a great man. There are many names of the present day which the self-appointed historians of the ages will place more prominently and carry further on their records; which, by the way, suggests the reliability and the intrinsic value of the historic estimate.

We were all sufficiently familiar with the personal appearance of the man, and we know that he did not look the great man, did not dress or carry himself as a great man, but was always in mien and act an ordinary man of the people, perhaps unusually well satisfied with himself, but still every man's equal and regarding every man as his equal. He was so closely in touch with the masses, and the masses felt so closely in touch with him that he has not usually been known or spoken of anywhere as *Mr.* Carnegie. He was just plain Andy to everybody, and with his full approval.

To all too many of us, to probably most of the world, Andy's supreme claim to regard and remembrance is in the single fact that he surpassed all the records as the direct, out and out, giver of money. It is not worth while to mention any figures, as there are no others with which to compare them. But the story of the phenomenal amount of his giving is only the beginning instead of the summing of the account. The manner and method of his giving was as exceptional as the amount of it. There was in the giving never any lack of appreciation of money values. There was never any giving as a result of reckless impulse. No dollar was slipped out with the mere hope that it might do somebody some good. His head and not his heart gave impulse and direction. When he went into the giving business he made a business of it, and conducted it upon the strictest business principles. The money was placed where it would be continuously working and producing results in the future, as in the libraries he founded and the various institutions which are to endure through the ages. He in his gifts required also the gifts or investments of others, who would thus be committed to the looking after the gifts and the maintenance of them in operative efficiency.

He was so determined that his money should not be wasted, but should be continuously making good after leaving his hands, that he made all his gifts during his active lifetime, so that he could see and be assured that the necessary conditions were fulfilled, instead of letting things go until after his death and then trusting to mercenary schemers for their final disposition. His gifts were thus true gifts and not compulsory leavings, and carry a suggestion of great opportunity too often ignored by those who have not the nerve to face the fact that they cannot carry their wealth any farther than they can carry their mortal flesh.

It is not worth while to go into any discussion as to whether Andy made the wisest possible use of his money after all. As to that there would be no limit to the diversity of opinion. His personal judgment was worth as much, and probably more than any other. He surely intended that his benevolence should beget beneficence, and did his utmost to make the planned results secure. We may conveniently assume and concede that he did the gratest possible amount of actual, practical good that his wisdom could dictate, and place him high upon a pedestal as a monumental philanthropist and so call his record closed for all the world to applaud and emulate.

But really this is not the biggest part of his life nor the thing most noteworthy. There was the making or the accumulating of the money preceding the giving of it, and when we come to that we may unhesitatingly assert as the paradox of his life that in the getting rather than in the giving of the money was the vastly greater and mightier achievement. Here we may say he was grandly successful without necessarily assuming for him a particle of benevolent intent. He may have been—which he wasn't—absolutely and entirely selfish and grasping in his business transactions, but in them, largely viewed, he did colossal good in spite of himself.

Not all accumulators of wealth, not all the founders of millionaire families, for instance, can have this truthfully said of them, for the ways and means of acquisition are various. It is not easy to see how he is a benefactor who grabs large holdings of land and sells it out in small parcels at ten times or a hundred times the

price, even if it be for the homes of the masses. Andy was no mere buyer and seller, and only that, either of land, or of food, or of any of life's necessities. He was pre-eminently both a buyer and seller, but between the buying and the selling the values were transformed, so that though he could sell at multiplied prices the augmented values were there for the buyer.

Andy in his real life work was essentially a creator of values as things passed through his hands, and, as values come entirely from work, he was above all a maker of work, a discoverer of opportunity, an organizer and stimulator of industry, a provider of profitable employment, of the means of comfortable and hopeful and worthwhile living for, directly and indirectly, hundreds of thousands of workers who could never, never, have provided it for themselves. And the good which he thus did lives after him. The industries to which he gave such a big share are to keep whirling along still gathering headway through the ages, and the crowd of prosperous workers continually increasing.

And yet, after all, Andy was as far as may be from being a saint. "Woe be unto you when all men shall speak well of you." He dodged that curse all right. If ever there was a man to be execrated and villified and detested by any class of the community here, surely he must have been the man and the class must instinctively have recognized him. What could he have been but the supreme bugaboo to those who teach, and to the greater mass of unfortunates who swallow the teaching, that there is only a certain amount of work to be done in the world, any way, and that the schemes of the workers should be to do as little work as possible, individually and collectively, in order that there may be enough work for all that the pay for it may continually increase.

Andy steps out most opportunely now if "more pay for less work" is to win, for surely his record is all the other way. There could never be any doubt of his purpose to produce to the utmost, and he had a marvelous faculty and facility for not only selecting men of force and judgment and loyalty for the execution of his purposes, but also to quicken and liven them in their doing, and his impulse and guidance was operative not only upon the leaders with whom he was personally in touch, but through them it permeated to the bottom of the mass of his coworkers.

He was always ready with appreciation and compensation for work well done. It is easy for us to believe that he made half a hundred of millionaires at the top of his industries, but all the way down also his men must have been fairly if not liberally paid, far more numerously than in most industrial organizations, where the men grow old in the service.

RAPID DEVELOPMENT OF GAS COMPRESSION PRACTICE

Not more than five or six years ago, commercial gas compression plants consisted of the simplest forms of gas pumps, single-stage compressors and primitive cooling coils. The plants operated only on rich casing-head gas that would produce four to six gallons of condensate with a capacity of not more than 200,000 or 300,000 cubic feet daily.

At present plants are in operation treating from 6,000,000 to 9,000,000 cubic feet of gas daily, yielding as low as one gallon of condensate per 1,000 cu.ft., using pressures of 250 and 300 lb. per sq. in. in two stages of compression, with elaborate systems of cooling the gas with water before compression and after each stage of compression. In some plants the gas is further cooled—temperatures as low as 0 deg. F. are often obtained, causing the precipitation of nearly all the condensable fractions commercially valuable for making gasoline.

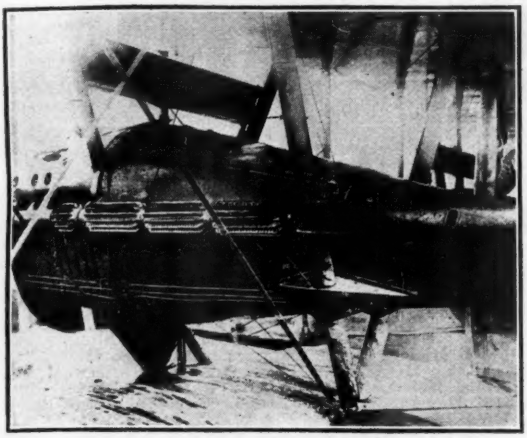
KEEPING SMOKESTACKS IN CONDITION

Owners of factories are usually interested in preventing the depreciation of their plant buildings and equipment by frequent painting, but they oftentimes are prone to forget to take corresponding precautions to insure the long life of their smokestacks. When rust puts a smoke stack out of business, it means putting up a new one and possibly the tie-up of the entire plant. Therefore, this important link in the equipment should be kept in good condition by painting about once every two years.

There is on the market a special smokestack paint which, drying to an enamel-like surface, prevents the metal of the stack from corroding as a result of exposure to moisture in the air and to gases in the smoke. It is also proof against the high temperatures to which stacks are subjected and may, if necessary, be applied when the stacks are hot. It is to the advantage of every mill owner to use this paint frequently to double the life of the smokestacks in his plant.

The Chicago Pneumatic Tool Company announces the removal of their Cincinnati Office from the Mercantile Building to the Walsh Building, Pearl and Vine Streets, where a service station with a complete stock of pneumatic tools, electric tools, air compressors, oil engines, rock drills, and repair parts will be maintained.

Trial of the Silencer Peri-Flammes Schneebeli



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THIS APPARATUS WHICH HAS JUST BEEN PURCHASED AND ADOPTED BY THE FRENCH ARMY REDUCES THE NOISE OF THE MOTOR AND SAVES THE FIRES BY RETURN OF THE FLAMES.

Latest U. S. Patents

Full specifications and drawings of any patent may be obtained by sending five cents (not stamps) to the Commissioner of Patents, Washington, D. C.

AUGUST 5.

1,311,866. PROCESS OF AND APPARATUS FOR REMOVING SAND FROM HOLLOW DRILL-RODS AND THE LIKE. Percy A. E. Armstrong, Loudonville, N. Y.

1. The process of removing core sand from bores of tubular bodies which consists in forcing compressed air into the bore while confining same so as to discharge primarily against the sand adjacent to the bore walls and loosen it therefrom, and in removing the loosened sand.

1,311,930. STRAIGHT-AIR EMERGENCY-VALVE DEVICE. Walter V. Turner, Wilkinsburg, Pa.

1,311,959. MILKING-MACHINE. Peter A. Frimand, Wilmette, Ill.

1,311,973. PNEUMATIC SEPARATOR. William George Jopson, Abington, Mass.

1,311,922. FLUID-CURRENT METER. Fred M. Slater, Easton, Pa.

1,312,097. AUTOMATIC SIGNAL APPARATUS TO INDICATE FAILURE OF LUBRICATING SYSTEMS. Levi G. Buckner and Samuel J. Sibley, Memphis, Tenn.

1,312,117. ANESTHETIC-MACHINE. Jonathan G. E. Hinkle, Bethany, Mo.

7. In an anesthetic machine in combination, means for forming a solution of anesthetic vapor in air, a pipe for supplying pressure air to said means, connections for leading said solution to a patient, and a valve bypath between said pipe and the said connection so arranged that air may be delivered into said connection without passing through said means and while said vapor forming means is in action.

1,312,194. OPERATING AND CONTROLLING MECHANISM FOR PLAYER-PIANOS. Philip J. Meahl, Summit, N. J.

1,312,253. AUTOMATIC CONTROL DEVICE. Carl F. Johnson, Milwaukee, Wis.

1,312,286. APPARATUS FOR EXCLUDING DENSE FOG. Jukichi Tejima, Ube, and Keisuke Kishida, Toyohigashi Yamaguchi, Japan.

2. In a device of the character described the combination with a sighting tube, a standard upon which the sighting tube is adpustably mounted, an outer tube surrounding the sighting tube and spaced therefrom to provide an annular chamber which is mounted at the forward end of the sighting tube, a compressed air pipe in the standard, and a flexible tube connecting the compressed air pipe to the chamber of the outer tube, the air being ejected from the open end of the outer tube in a tubular jet which surrounds the line of sight and serves to exclude fog therefrom.

1,312,330. LUBRICATOR FOR AIR-COMPRESSORS. John P. Kelly, Pittsfield, Mass.

1,312,355. PNEUMATIC FOLDING ATTACHMENT FOR KEEPING DAMAGED VESSELS AFLOAT. John T. Reid, Lovelock, Nev.

1,312,357. AIR-BRAKE APPARATUS. Zala Riddle and Norman F. Wilkins, Dunsmuir, Calif.

1,312,484. APPARATUS FOR OZONE GENERATION. William John Knox, New York, N. Y., and John P. Mallett, Elizabeth, N. J.

1,312,495. PNEUMATIC ACTION FOR MUSICAL INSTRUMENTS. Morris S. Wright, Worcester, Mass.

AUGUST 12.

1,312,588. SUCTION AND PRESSURE CREATING APPARATUS. Benjamin Skidmore, Jr., Chicago, Ill.

1,312,615. METHOD OF AND APPARATUS FOR APPLYING FLUID-PRESSURE. Simon Cooper, New York, N. Y.

1,312,619. APPARATUS FOR TREATING PARTS OF THE HUMAN BODY. Isabel D'Orsay, New York, N. Y.

1. Apparatus for the treatment of the body comprising a pair of vacuum applicators adapted to be adjusted by the hands of the user, an exhaust pump, a mouth piece connected to the exhaust end of the pump, and auxiliary means for holding the vacuum.

1,312,642. COMPRESSED-AIR GREASE-GUN. Harry N. Niemann, Armstrong, Iowa.

1,312,649. FLUID-PRESSURE BRAKE. Walter V. Turner, Wilkinsburg, Pa.

1,312,650. PUMP-LUBRICATOR. Walter V. Turner, Wilkinsburg, Pa.

4. A lubricator for fluid compressors comprising a casing having a chamber containing a quantity of lubricant and having a passage leading from the space above the surface of the lubricant to the fluid compressing cylinder of the compressor, a fluid chamber having a passage communicating with the lubricant chamber below the surface of the lubricant and having a passage communicating with the fluid compressing cylinder, and a check valve for preventing back flow from the fluid chamber to the fluid compressing cylinder.

1,312,816. PNEUMATIC-CONVEYOR HOPPER. Louis C. Vanderlip, Elkhart, Ind.

1,312,948. AIR-MOISTENER. Eli J. Bushey, New York, N. Y.

1,313,030. ELECTROPNEUMATIC BRAKE. Walter V. Turner, Wilkinsburg, Pa.

1,313,160. PROCESS FOR COMPRESSING CHLORIN AND OTHER GASES. Leone Levi Bianchini, Rome, Italy.

1,313,203. SUCTION FLY-CATCHER. Harry Pakeman, Niles, Ohio.

1,313,205. GLASS-BLOWING APPARATUS. Harvey E. Quackenbush and Clinton L. Quackenbush, Bloomfield, N. J.

AUGUST 19.

1,313,306. SAND-BLAST MACHINE. William Henry Leiman and George William Leiman, Newark, N. J.

1,313,363. AIR-COOLED CONDENSER FOR REFRIGERATING-MACHINE. Edward Thompson Williams, New York, N. Y.

1,313,406. VACUUM-TUBEREPEATER. Robert C. Mathes, New York, N. Y.

1,313,533. LOW-PRESSURE ALARM FOR PNEUMATIC TUBES. William Andrew Harris, Greenville, S. C.

1,313,553. INFLATING-VALVE. Frederick Nielsen, Boston, Mass.

1,313,698. METHOD OF GENERATING PRESSURE. Alexander T. Kasley, Swissvale, Pa.

1,313,763. SHOCK-ABSORBER. Edmund P. Thomas, Centralia, Wash.

1,313,767. VALVE FOR AIR STARTER SYSTEMS. John F. Upton, Sapulpa, Okla.

1,213,842. AIR-MOTOR. Salvatore Tridico, Brooklyn, N. Y.

1,313,859. DRILLING APPARATUS. George H. Gilman, Claremont, N. H.

1,313,861. HOT-AIR DENTAL SYRINGE. James

Ernest Reid, Moorestown, and Frederick W. Side, Camden, N. J.
1,313,867. PISTON-CONTROLLING MECHANISM, Henry H. Mercer, Claremont, N. H.

AUGUST 26.

1,313,924. PNEUMATIC ARCH AND HEEL SUPPORT. Benjamin Stewart, Erie, Pa.
1,314,056. FUEL-CHARGE-SUPPLY APPARATUS. John Good, Brooklyn, N. Y.
1,314,153. LIQUID TRANSMISSION. Eugene Schneider, Paris, France.
1,314,163. PNEUMATIC ACTION FOR AUTOMATIC MUSICAL INSTRUMENTS. Selviyor A. Swanson, North Tonawanda, N. Y.
1,314,168. FLUID-PRESSURE BRAKE. Walter V. Turner, Wilkinsburg, Pa.
1,314,175. FURNACE FOR CONVERTING ENERGY OF FUEL INTO FORCE. Willet C. Wells and Frank E. Wells, Columbus, Ohio.
1. A furnace having means for supplying fuel thereto, means for admitting compressed air to support combustion therein, and means for admitting compressed air to be expanded therein by heat in bringing the gases of combustion to a serviceable temperature, said temperature automatically controlling both said means of admitting said air.
1,314,198. TRACK-SANDING DEVICE. Frederick D. McGinley and Thomas J. Coughlin, Syracuse, N. Y.
1,314,246. ROCK-DRILL. Omar E. Clark, Denver, Colo.
1,314,277. AIR-PUMP AND CLEANING DEVICE. Albert Loppacker, Bloomfield, N. J.
1,314,288. MOTOR. Daniel S. Waugh, Denver, Colo.
1,314,316. APPARATUS FOR SEPARATING ORE MATERIALS FROM EACH OTHER. Frederick B. Flinn, Orange, N. J.
1,314,342. PNEUMATIC ROLL. George A. Lawrence, Woburn, Mass.
1,314,360. AIR-COMPRESSOR. Gordon Phillips, Cobalt, Ontario, Canada.
1,314,409. VACUUM APPARATUS. Thomas McConnell, New Kensington, Pa.
1,314,443. AIR CLEANING ATTACHMENT FOR AIR-COMPRESSORS. Thomas E. Taylor, Kansas City, Mo.
1,314,473. INCUBATOR. Charles M. Heck, Raleigh, N. C.
1. In an incubator, the combination with an incubating chamber, of a warm air supply, a hot air supply, means for conducting air from said supplies to said chamber and discharging it above eggs or like producers of animal heat in said chamber, a thermostat positioned near said eggs, means for shielding said thermostat from the direct discharge of air from said supplies, and means operated by said thermostat to cut off one of said supplies and control the volume of air supplied by the other supply.

SEPTEMBER 2

1,314,539. AIR-LIFT PUMP. Frank P. Rust, Detroit, Mich.
1,314,553. COMPRESSED-AIR STARTING AND REVERSING DEVICE FOR INTERNAL-COMBUSTION ENGINES. Jonas Albert Weyland, Djursholm, Sweden.
1,314,564. AIR-FILTER FOR GAS-ENGINES. Frank Belleville and Edwin A. Belleville, Twin Falls, Idaho.
1,314,693. SUCTION CLEANING DEVICE. William V. Orr, Cleveland, Ohio.
1,314,740. APPARATUS FOR BURNING PULVERIZED FUEL. Charles J. Gadd, Lebanon, Pa.; Anna Eyre Gadd executrix of said Charles J. Gadd, deceased.
1. In a pulverized fuel burner, in combination, two co-axial air-carrying pipes, two co-axial discharge nozzles, one for each pipe and spaced ball-and-socket jointed connections between the nozzles and the respective pipes, providing for separate control of the contents of the two pipes, as far as the end of one of the nozzles.
1,314,773. APPARATUS FOR CHARGING CYLINDERS WITH OXYGEN. Max von Recklinghausen, New York, N. Y.
1,314,850. AIR-GUN DISCHARGE MEANS. Benjamin L. Blair, Indianapolis, Ind.
1,314,914. BLOWPIPE. Yosi Tamaki, Los Angeles, Calif.
1,319,919. GAS AND AIR MIXER. George P. Washburn, Los Angeles, Calif.
1,314,973-4-5-6-7. AIR-BRAKE APPARATUS. Spencer G. Neal, New York, N. Y.
1,315,065. AERIAL-NAVIGATION INSTRUMENT. Harry Egerton Wimperis, Goring, England.
1,315,089. AIR-PUMP. George L. Camfield and Vernon F. Shutt, Colorado Springs, Colo.
1,315,104. PNEUMATIC CONTROL APPARATUS FOR MOTOR-VEHICLES. Frank X. Ewald, La Salle, Ill.
1,315,164. SYRINGE. Oscar O. R. Schwidetzky, Hasbrouck Heights, N. J.
1,315,165. HOLDING MEANS FOR DRAIN-VALVES OF AIR-BRAKE SYSTEMS. Patrick M. Searson, Jersey City, N. J.
1,315,173. AUTOMATIC PRESSURE-RELIEF VALVE FOR PNEUMATIC TIRES. Luther Marion Wampler, Liberal, Kans.

SEPTEMBER 9

1,315,212. EXPRESSION-CONTROLLING DEVICE FOR PNEUMATIC PLAYERS. Frank J. Clark, Milwaukee, Wis.
1,315,233-4. ROTARY BLOWER. John T. Needham, Bayonne, N. J.
1,315,254. PROCESS AND APPARATUS FOR COOLING CEMENT-KILN GASES AND THE RECOVERY OF DUST THEREFROM. Levi Stevens, Alpena, Mich.
1,315,325. HOSE-TESTING DEVICE. Stuart A. Nims, Keene, N. H.
1,315,327. PRESSURE-GAGE. Josiah W. Place, Brooklyn, N. Y.
1,315,422. POWER-DRILL. John M. Roberson, Seattle, Wash.
1,315,433. MOTOR-DRIVEN COMPRESSOR. Lewis L. Tatum, Milwaukee, Wis.
1,315,482. NON-SLIP PNEUMATIC TREAD. Charles Francis Dyer, Brooklyn, N. Y.
1,315,517. HUMIDITY CONTROL. Arthur E. Krick, Indianapolis, Ind.
1,315,636. SELF-PLAYING MUSICAL SIREN-HORN. Joseph Papp, Revere, Mass.
1,315,719. APPARATUS FOR BURNING POWDERED COAL. Aubrey J. Grindle, Chicago, Ill.
1,315,765. SPRAYING DEVICE. Edmund Eckart, New Rochelle, N. Y.
1,315,772. APPARATUS FOR UTILIZING AN EXPANSIVE FORCE. Herbert Alfred Humphrey, London, England.
1,315,858. FLUID-PRESSURE INDICATOR. Josua Gabriel Paulin, Stockholm, Sweden.
1,315,871. COMBINATION AIR AND HAND POWER JACK. Lawrence R. Shadwick, Palestine, Ill.
1,315,882. PNEUMATIC CONTACT-FRAME. Emanuel W. Sweigard, Chicago, Ill.
1,315,931. MEANS FOR MIXING STEAM WITH AIR. Jan Hendrik Poppink, Tilburg, Netherlands.

SEPTEMBER 16

1,316,072. COW-MILKING MACHINE. Carl Oscar Anderson, Springfield, Ill.
1,316,073. HUMIDIFIER. James A. Andrews and John W. Herbert, Biddeford, Me.
1,316,077. PNEUMATIC-TUBE SYSTEM. John S. Black, Clayton, Mo.
1,316,139. AIR-COMPRESSOR. Horace M. Cake, Philadelphia, Pa.
1,316,144. AIR-FILTER. Austin O. Craven, Detroit, Mich.
1,316,164. FLUID-DRIVE MECHANISM FOR AUTOMOBILES. Milton A. Kettler, Washington, D. C.
1. In a fluid driving means for automobiles the combination of a rotary pump adapted to place the fluid under compression; a rotary power shaft for rotating said pump; a motor having rotary abutments adapted to be driven by said fluid; a connection between said pump and motor comprising driving and return passages and a plurality of channels in multiple within the casing of said motor; and rotary means adapted to cut off one or more of said channels to change the speed of said motor, substantially as described.
1,316,204-5-6-7. BRAKE SYSTEM. Walter V. Turner, Wilkinsburg, Pa.
1,316,340. SUCTION APPARATUS FOR SURGICAL USE. Albert H. Tuttle, Cambridge, Mass.
1,316,342. OZONE-GENERATOR. Albert E. Walden, Baltimore, Md.
1,316,417. AIR-PUMP FOR PNEUMATIC TIRES. Edward R. Buchanan, Paducah, Ky.
1,316,423. PNEUMATIC ARCH-SUPPORT. Rose S. Carling, Los Angeles, Calif.
1,316,442. VACUUM-CLEANER. Charles L. Goughnour, Pasadena, Calif.
1,316,445. APPARATUS FOR FIXATION OF ATMOSPHERIC NITROGEN. James Simpson Island, Hamilton, Ontario, Canada.

PEACE ON EARTH, GOOD WILL TOWARD MEN,
INDUSTRIALLY AND POLITICALLY!

Compressed Air MAGAZINE

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